I.T. Transport Ltd.

DFID Department for International Development

# THE VALUE OF TIME IN LEAST DEVELOPED COUNTRIES: THE AFRICAN STUDIES (R8307)

# FINAL REPORT

**Unpublished Project Report**

**Contract No. R8307**

**July 2005**

**I.T. Transport Ltd., Ardington, Oxfordshire, United Kingdom**

| | |
|---|---|
| Sector: | Transport |
| Theme: | T4: Increase the efficiency of national and regional transport systems whilst safeguarding the interest of poor and vulnerable users |
| Project Title: | The Value of Time in Least Developed Countries: The African Studies |
| Contract No.: | R8307 |

| APPROVALS | | | |
|---|---|---|---|
| Project Manager | | Quality reviewed | |

# THE VALUE OF TIME IN LEAST DEVELOPED COUNTRIES: THE AFRICAN STUDIES (R 8307)

## ACKNOWLEDGEMENT

We gratefully acknowledge the financial assistance of the UK Department for International Development (DFID) for conducting the study. The study required assistance from a large number of people and organisations. Therefore, the list of people and organisations to thank is very long. We would like to thank every person and organisation who helped to make the project a success, including the respondents in Ghana and Tanzania who agreed to be interviewed and spent a considerable amount of time during the interview.

## TABLE OF CONTENTS

## LIST OF APPPENDICES

## LIST OF TABLES

## LIST OF FIGURES

## ABBREVIATIONS

| | |
|---|---|
| Cedi | Ghanaian Currency |
| DFID | Department for International Development |
| FGD | Focus Group Discussion |
| GDP | Gross Domestic Product |
| GNP | Gross National Product |
| GNI | Gross National Income |
| GoG | Government of Ghana |
| GPRS | Ghana Poverty Reduction Strategy |
| HL | Hierarchical Logit |
| hr | Hour |
| IMT | Intermediate Means of Transport |
| IVT | In-vehicle time |
| KaR | Knowledge and Research |
| km | Kilometres |
| LDC | Least Developed Country |
| min | Minutes |
| MNL | Multinomial Logit Models |
| NMT | Non-motorised Transport |
| PPP | Purchasing Power Parity |
| PRA | Participatory Rural Appraisal |
| RDP | Regional Domestic Product |
| RP | Revealed Preference |
| SCF | Standard Conversion Factor |
| SP | Stated Preference |
| sq km | Square Kilometre |
| SWR | Shadow Wage Rate |
| Tk | Taka (Bangladeshi Currency) |
| TZS | Tanzanian Shilling (Tanzanian Currency) |
| VOC | Vehicle Operating Cost |
| VoT | Value of Time |
| WB | World Bank |
| WDR | World Development Report |
| WLKT | Walking Time |
| WT | Waiting Time |
| WTP | Willingness to Pay |

## GLOSSARY OF TERMS

| | |
|---|---|
| **Mammy Wagon** | A Mammy Wagon is a wooden construction on a lorry chassis used for carrying both goods and passengers. They are popular in rural Ghana |
| **Hiace** | Local name for Minibuses in Tanzania |
| **Trotro** | Local name for Minibuses in Ghana |

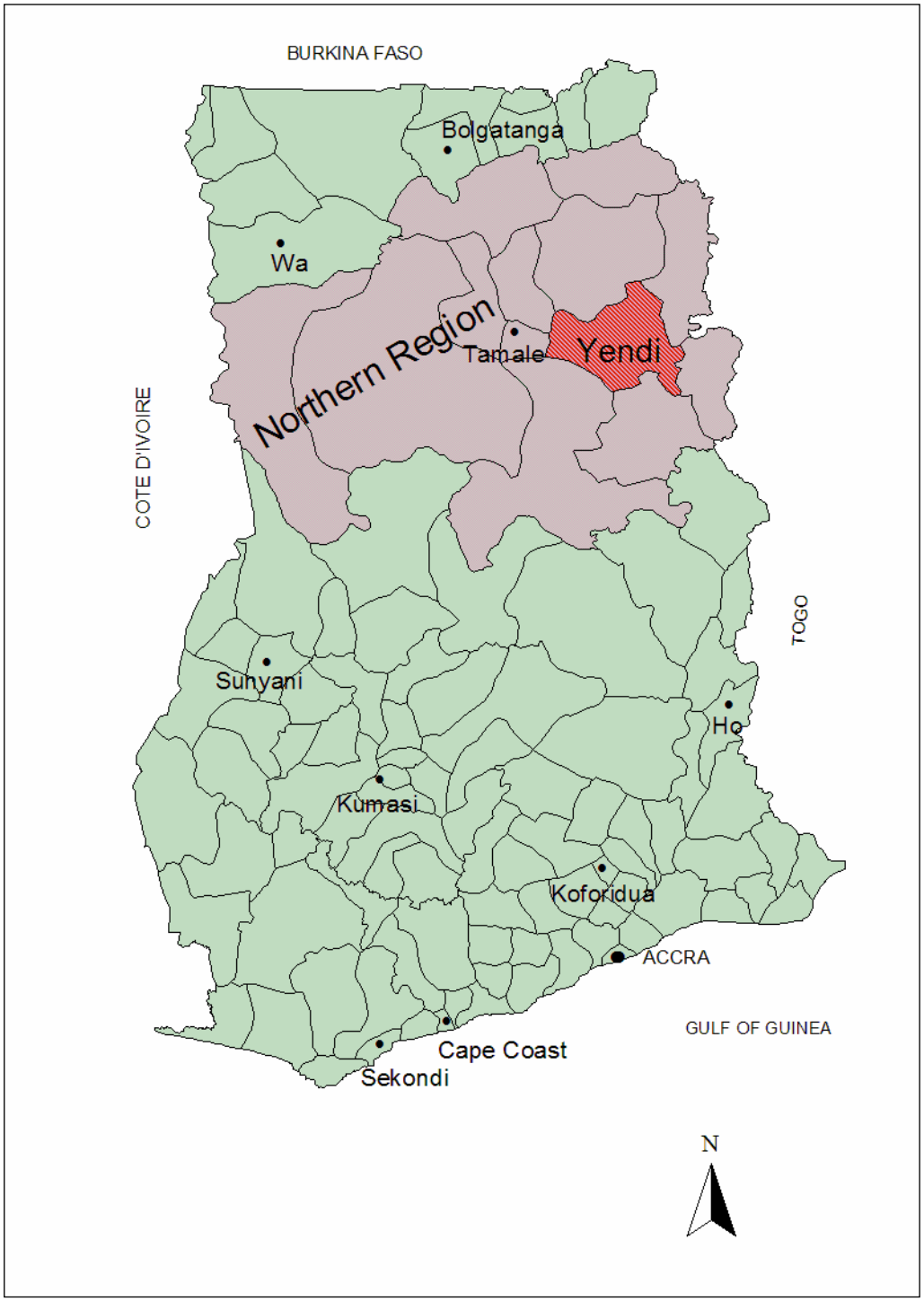
****

## CURRENCY EQUIVALENTS

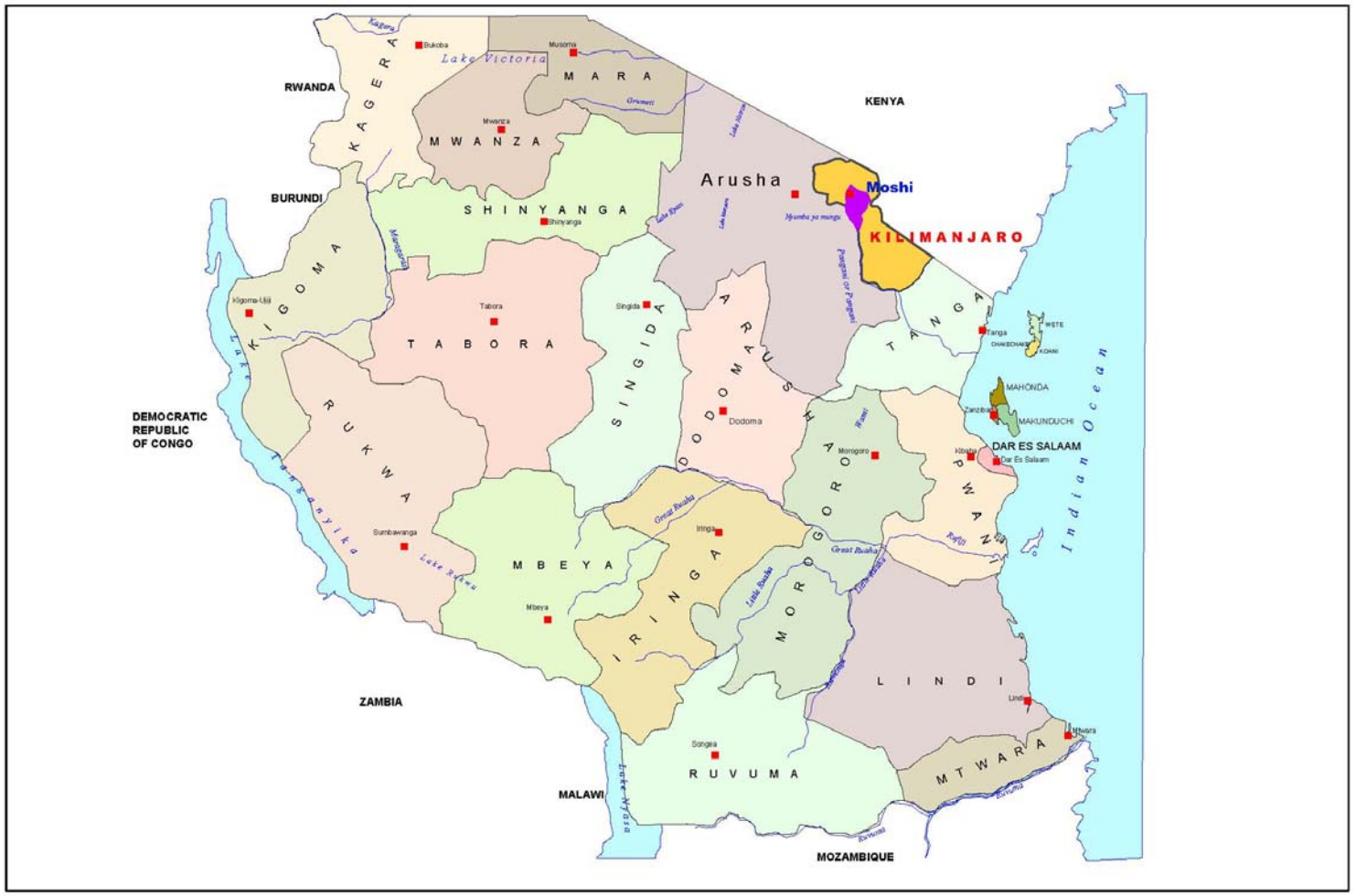
1 US$ = Approx. 9,000 Ghanaian Cedi (As of June 2004)
1 UK£ = Approx. 16,250 Ghanaian Cedi (As of June 2004)

1 US$ = 1,060 Tanzanian Shillings (TZS) (As of December 2004)
1 UK£ = 1,950 Tanzanian Shillings (TZS) (As of December 2004)

## MAP I: GHANA SHOWING NORTHERN REGION & YENDI DISTRICT



## MAP II: TANZANIA SHOWING KILIMANJARO REGION AND MOSHI DISTRICT



## EXECUTIVE SUMMARY

1.1. The inclusion of travel time saving benefits in the economic analysis of transport projects is standard practice in developed countries and accounts for a large proportion of the benefits from transport infrastructure investment. However, in most developing countries, and especially in rural areas, travel time savings are either not included at all or are based on questionable assumptions or methodologies.

1.2. This is a report on the second study undertaken by IT Transport with financial support from the Department for International Development (DFID). It was designed to test the applicability of conventional Stated Preference and Revealed Preference models for valuing the time savings of rural travellers in least developed countries (LDCs) and to develop and demonstrate a robust methodology for estimating values of travel time savings which could be used in developing countries.

1.3. The first study undertaken in Bangladesh demonstrated the suitability of applying conventional preference ranking approaches for estimating the value of time savings for rural travellers. In order to gain greater confidence in the suitability of the approach, it was considered important to test the replicability of the approach under different local conditions. This study was designed to test the approach in Ghana and Tanzania, where population densities are lower, communities are more widely dispersed and the transport sector is less diverse and competitive than in Bangladesh. Furthermore, the two selected study locations were very different. Yendi District in Northern Region in Ghana is hot, arid and relatively poor with a low population density whereas Moshi Rural District in Tanzania is in a relatively prosperous and more densely populated part of the country.

1.4. The studies have demonstrated that in order to use preference ranking approaches effectively, it is essential to develop a thorough understanding of the local situation (means of livelihood, role of transport in the economic and social lives of people, the balance of decision making and financial powers between genders within households and travelling habits). Such understanding is needed for the design of the preference questionnaires and interpretation of the results. The qualitative component required for understanding the local context in the Africa studies was a refinement of the approach initiated in Bangladesh.

1.5. This study confirms the Bangladesh study conclusion that the conventional stated preference methodology is appropriate in a developing country context. As in Bangladesh, the main adaptations needed were in the construction of the questionnaires and interpreting the results. The revealed preference approach proved to be even more problematic in the Africa studies than in Bangladesh.

1.6. Table S.1 summarises the main results of the analysis of stated preference data for Ghana and Tanzania and includes the Bangladesh results for comparison. The average in-vehicle time (IVT) saving values (nominal US$ equivalents) are almost identical in Ghana and Tanzania and substantially higher than in Bangladesh.

However, the IVT results for Tanzania should be excluded when reaching general conclusions because IVT and walking time values could not be separated during analysis. The base average IVT values as per cent of the rural wage rates are of similar order of magnitude in the three countries, ranging between 49% and 64%.

**Table S.1: Summary of estimated travel time saving values**

| | Ghana (2004) | | Tanzania (2004) [a] | | Bangladesh (2001) | |
|---|---|---|---|---|---|---|
| | **Cedi/hr** | **US$/hr** | **TZS/hr** | **US$/hr** | **Taka/hr** | **US$/hr** |
| **Base values** | | | | | | |
| IVT (men) | 1731 | 0.19 | 213 | 0.20 | 4.75 | 0.08 |
| IVT (women) | 1523 | 0.17 | 177 | 0.17 | 2.25 | 0.04 |
| IVT (average) | 1627 | 0.18 | 195 | 0.18 | 3.50 | 0.06 |
| IVT (average) as % of wage rate per hour | 64% | | 49% | | 51% | |
| IVT (average) as proportion of household income per hour | 52% | | 82% | | 21% | |
| WLKT (men) | 2991 | 0.33 | 319 | 0.30 | 5.16 | 0.09 |
| WLKT (women) | 2782 | 0.31 | 265 | 0.25 | 2.66 | 0.05 |
| WLKT (average) | 2886 | 0.32 | 292 | 0.28 | 3.91 | 0.07 |

Notes: **[a]** In-vehicle time (IVT) and walking time (WLKT) values could not be estimated separately. Calculated under the assumption that the WLKT value is 50% higher than the IVT time value.
**IVT** – In-vehicle time, **WLKT** – Walking time.

1.7. Based on these results (excluding the Tanzanian figure), the World Bank guideline of value of time[1] for non-work journeys at 33% of the hourly household income appears to be reasonable. The variations between countries indicate that, ideally country-specific studies reflecting local conditions should be carried out.

1.8. In all three countries, there is a substantial difference between the travel time saving values for men and women. The higher value of time for men probably reflects their greater ability and willingness to pay because they are typically the cash earners and control the family budget. However, qualitative studies confirm that this value of time differential does not truly reflect the relative time pressures faced by men and women. The most disadvantaged in this respect are likely to be women from poorer households who are under the most severe time constraints.

1.9. Table S. 2 shows the additional travel time saving values associated with different travel and socio-economic attributes. For example, uncomfortable travelling would increase the willingness to pay by Cedi 1,388 (US$ 0.15) in Ghana while a poor traveller's willingness to pay is Cedi 173 (US$ 0.02) lower than the base in-vehicle time.

[1] Gwilliam (1997)

**Table S. 2: Summary of addional travel time saving values**

| | Ghana (2004) | | Tanzania (2004) | | Bangladesh (2001) | |
|---|---|---|---|---|---|---|
| | **Cedi/hr** | **US$/hr** | **TZS/hr** | **US$/hr** | **Taka/hr** | **US$/hr** |
| **Additional computed values (selected variables)** | | | | | | |
| Children | -345 | -0.04 | -94 | -0.09 | NT | NT |
| Uncomfortable travel | 1,388 | 0.15 | 110 | 0.10 | 2.29 | 0.04 |
| Market day | NS | NS | NS | NS | 1.47 | 0.03 |
| Permanent job | 1,515 | 0.17 | NS | | 14.72 | 0.26 |
| With a load | NS | NS | NS | NS | 0.48 | 0.01 |
| With a watch | 259 | 0.03 | 35 | 0.03 | NT | NT |
| Poor traveller | -173 | -0.02 | -84 | -0.08 | 0.31 | 0.01 |
| Poor road | NS | NS | 51 | 0.05 | NS | NS |

Notes: **NS** - Not significant, **NT** – Not tested

1.10. The key points on the additional attributes can be summarised as follows:

- Children's value of time is lower than that for adults but not as low as the recommended 50% of adult value in the World Bank guidelines.
- A number of aspects (market day travel, safe travel, social and leisure travel as opposed to travel for an economic purpose, travelling with a load and wet season travel) did not affect the willingness to pay in both countries.
- The willingness to pay of poor travellers in Ghana and Tanzania is lower than the average and whilst not unexpected, differs from the Bangladesh case where it was higher than average and probably reflects the tight time constraints of the poor and their need for off-farm earning.

1.11. Because of the diversity of rural livelihoods, the Bangladesh study made a case for broadening work related trips to include trips made in the course of work as self employed, and trips made for purchasing/selling goods for profit (in addition to trips while 'working for an employer'). This proposed redefinition is also valid in the African context. Time saving values of these trips should be equal to at least the relevant wage rates.

1.12. Another key finding of the study is that the proportion of trips that had a secondary purpose was higher in the two study countries than in Bangladesh. While about 14 per cent of journeys in Bangladesh had a secondary purpose, the equivalent weighted average figure for Ghana and Tanzania was 29 per cent (22 per cent and 40 per cent in Ghana and Tanzania respectively).

1.13. Inclusion of value of time savings in the economic analysis of rural infrastructure projects would clearly lead to higher returns for such projects and redress the bias against rural infrastructure investment. The next tasks are: (a) to assess the impact of including value of time savings in project appraisal on rural transport infrastructure investment; (b) to develop practical guidelines for estimating and applying value of time in the rural transport project appraisal, and (c) to conduct empirical studies of modal shifts and time savings resulting from rural infrastructure and services improvement, an area in which current knowledge is very limited.

# 1. INTRODUCTION

Travel time savings can account for as much as 80% of the overall benefits of transport projects in developed countries. The relevant authorities either prescribe values of travel time savings to be used in the economic evaluation of transport projects or set out guidelines for estimating such values. Although the importance of travel time savings is widely recognised in developing countries, the practice of including the value of travel time savings in the appraisal of transport projects, especially rural projects, is not widespread. A number of somewhat interrelated reasons have contributed to this exclusion. The first is concerned with the applicability of conventional models of value of time (VoT) estimation in rural areas in developing countries where work patterns, particularly of the poor, are diverse.

Low rural incomes and underemployment also underlie the assumption of very low or even zero VoT of rural people at the margin and therefore justification for ignoring time saving benefits. Consequently, vehicle operating cost savings are typically assumed to be the most important economic benefits of rural transport investment projects. VoT savings are often included for urban and inter-urban transport projects in developing countries. Therefore, there is an inherent bias against rural projects. Because the incidence of poverty is typically higher in rural areas than in urban, rural pro-poor effects of transport project are also lost by the exclusion of VoT savings in appraising rural projects.

The travel and transport related activities undertaken by rural people in general and the poorer sections of the rural population in particular in Least Developed Countries (LDCs) take place on local roads, tracks and paths and they usually involve either walking or headloading. Therefore, if the local transport infrastructure and transport services are improved, they are likely to bring about substantial time savings, in addition to Vehicle Operating Cost (VOC) savings, due to modal shifts and improved speeds. In the context of global efforts to reduce poverty, factoring the value of rural travel time savings in investment decisions in LDCs would lead to more pro-poor allocation of resources.

Conventional approaches to valuing time used routinely in developed countries assume that most people work in formal employment and journeys can easily be differentiated into “for working purposes” and “for non-working purposes.” The augmented wage rate (i.e. the wage rate, related taxes and compulsory contributions and other employment related costs) representing the cost to the employer of the time spent by the employee in travelling during working time represents the value of working time savings. The value of non-working time savings are represented by the willingness to pay (WTP) to save travel time and transfer it to leisure activities. Appendix I presents the theoretical basis underlying the VoT concept along with a mathematical expression for VoT.

The conventional “western” distinction between working and non-working time savings cannot be applied in the rural economies of developing countries without

some adaptation. A large proportion of the rural population is engaged in a combination of formal and informal employment, subsistence production and activities such as fetching water and fuel which are essential for the household. Typically, a small minority of the labour force is engaged in formal wage employment. Therefore, in arguing a case for routine inclusion of travel time saving values in the appraisal of rural transport/access projects in developing countries, the challenge is to develop a methodology for valuing rural travel time savings which can accommodate the diversity of work and subsistence activities, multi-purpose travel and time use patterns of rural households which is robust and simple enough to be used in routine economic evaluations.

In 2001 IT Transport undertook a study in Bangladesh, with the financial support of the UK Department for International Development (DFID), to address the issue of valuing rural travel time savings in LDCs. The purpose of the study was *to develop, empirically test, and disseminate a methodology for deriving VoT in LDCs for transport/accessibility project appraisal*. The VoT study in Bangladesh (hereinafter referred to as the Bangladesh study) completed by mid-2002, demonstrated the feasibility of estimating VoT for rural travellers in an LDC. The study also highlighted a number of issues which need attention and identified a number of personal and travel related attributes which can influence travel time saving values of rural travellers.

The Bangladesh study reviewed the available literature on VoT in both developing and developed country contexts (see IT Transport, 2002 and Appendix I in this report). The main conclusions from the review were:

- approaches to the valuation of travel time savings and the VoT varied considerably between developed countries;
- while approaches in some developed countries differentiate between working and non-working time savings, such a distinction is not made in other countries and a single VoT value is used;
- working time saving values were based on wage rates, non-working time saving values were estimated using preference approaches, either Revealed Preference (RP) or Stated Preference (SP);
- in developing countries the distinction between working and non-working time saving values was rarely made, even for urban or inter-urban projects;
- the majority of approaches in developing countries linked VoT with indirect indicators (e.g. Gross Domestic Product (GDP) or the wage rate) and widely differing values were applied (e.g. in Brazil a value of 362% of GDP per productive hour for car/taxi passengers was recommended while in Kenya the value used for similar users was only 45% of GDP);
- there were a few reported cases of the use of preference approaches to value travel time savings in developing countries;

- where valuation of travel time savings involved the preference approach, use of proper experimental procedures was rare, and
- studies in developing countries produced widely differing travel time saving values.

In summary findings of the Bangladesh study were the following:

i. The western concept of dividing travel time savings into working and non-working time savings is valid in the rural context of a developing country. However, only a small proportion of total rural trips can be defined as "working trips" according to the conventional western definition. Working trips need to be redefined to include trips made in the course of work as self employed, and trips made for purchasing/selling goods for profit - in addition to trips while 'working for an employer'. The value of time savings during working time defined in this manner should be equivalent to the marginal value of income of the travellers.

ii. Use of a preference approach in the estimation of WTP to save non-working time was found to be suitable. IT Transport (2002) and Ahmed and Vaidya (2004) discuss alternative preference approaches, notably SP and RP, and their suitability in the rural context. The SP method was found to be much more suitable than the RP method.

iii. The Bangladesh study also produced a set of travel time saving values – base in-vehicle time (IVT) saving value, walking time saving value and other time saving values that can be linked to personal attributes of travellers, trip purpose, mode and seasonality (IT Transport, 2002; Ahmed and Vaidya, 2004). Appendix II summarises the estimated rural time saving values in Bangladesh.

A question that remained at the end of the Bangladesh study was whether the methodology used in Bangladesh could be replicated successfully in other developing countries. Bangladesh is a densely populated country with a highly competitive transport sector offering a range of non-motorised and motorised transport mode options. Before reaching firmer conclusions on the robustness of the methodology and the validity of the results obtained, it was felt necessary to conduct similar studies in countries and locations with different physical, demographic and transport characteristics, especially where population densities are lower, communities are widely spaced and the transport sector is less diverse and competitive. A limitation of the Bangladesh study was that it did not attempt to value children's travel time savings. Given that children play and an important role in the social and economic development in rural areas of developing economies, valuation of their time is important in the LDC context.

Therefore, a further study was undertaken by IT Transport, with financial assistance from DFID, under its Knowledge and Research (KaR) programme, in early 2004 in two countries in Africa - Ghana and Tanzania. The principal issues the study sought to address are set out below:

i. Whether the general conclusions from the Bangladesh study are valid in the African context and especially in other countries characterized by low population densities, widely spaced communities, longer journeys and travel times and less diverse and competitive transport services. If there are differences, what are they and what are their possible reasons.

ii. Whether the set of time saving values (in-vehicle, walking and other values that are linked to personal and travel attributes) can be estimated for rural residents in Africa using either the Bangladesh methodology or a methodology adapted for conditions in those countries. If such values can be estimated, whether there are glaring differences in values and to what extent they can be explained by differences in income levels and other socio-economic conditions.

iii. What policy implications emerge from the African and Bangladesh studies?

This report presents the findings of the African VoT studies. Apart from this introductory chapter, there are four more chapters:

Chapter 2: Presents the socio-economic and transport context of the study areas and explains the quantitative and qualitative methodologies used in the study.

Chapter 3: Explains how the threshold per capita expenditure and other methods were used to identify the socio-economic status of respondents and presents the results of the travel purpose and activity patterns data analysis.

Chapter 4: Presents the base in-vehicle time values and differences from base values related to socio-economic attributes of travellers and trip features for Ghana and Tanzania; compares time saving values for Ghana, Tanzania and Bangladesh; assesses the suitability of the World Bank (WB) guidance on VoT in the context of the results of the Bangladesh and Africa studies; and critically reviews the suitability of different preference approaches in the valuation of rural travel time savings in LDCs.

Chapter 5: Presents the conclusions of the study and makes policy recommendations.

# 2. STUDY AREAS AND METHODOLOGIES

## 2.1 Socio-economic and Transport Contexts of the Study Areas

The field study to value rural travel time savings in Africa was carried out in Yendi District, Northern Region, in Ghana and Moshi Rural District, Kilimanjaro Region, in Tanzania. This chapter provides a brief outline of the socio-economic and transport characteristics of the study areas in the context of the national situation. The chapter also explains the qualitative and quantitative methodologies used to value travel time savings.

### 2.1.1 Socio-economic and transport contexts of Yendi District, Northern Region, Ghana

Ghana has a land area of 239,000 square kilometres and a population of 18.91 million (Ghana Statistical Service, 2002). This means a population density of approximately 79 persons per sq km. The annual population growth rate is 2.7%. The population density varies considerably across the 10 administrative regions with Greater Accra being the most densely populated region (895 persons/sq km) and the Northern Region being the most sparsely populated (26 persons/sq km). A majority (56%) of Ghana's population is rural. Over 50% of the economically active population is engaged in agriculture, forestry or fishing in Ghana. This figure rises to almost 80% in the 3 northern regions.

The country displays important variations in climate and topography. There are six main ecological zones defined on the basis of climate, vegetation and soils. These are Rainforest, Semi-deciduous forest, Transitional zone, Coastal savannah (made up of grassland, strand and mangrove areas), Guinea savannah and the Sudan Savannah or Sahel. The Guinea savannah covers over 40% of the country and includes the majority of the northern regions. Variations in topography and ecology have resulted in distinct agricultural areas, with the Guinea savannah areas relying largely on cattle and grain production. Farming in Ghana is still largely undertaken by smallholders and is usually rain-fed and labour-intensive. Yam, maize, cassava and plantain are the main staple crops, although millet, sorghum, groundnuts and soya are also grown (with variations across the country). Livestock farming (cattle, sheep, goats and fowl) is an important source of income in the north of the country.

The Ghana Living Standard Survey (April 1998-March 1999) shows that more than a fourth (27%) of the population live in extreme poverty[2] (Government of Ghana, 2003). The geographical variation in extreme poverty incidence ranges from 2% (Greater Accra) to 59% (rural savannah). Reflecting the typical situation in developing countries, poverty incidence is much higher in rural areas than in urban areas with 36% of the rural population living in extreme poverty compared with 17% of the urban population. At the national level, despite the 10 percent drop in the proportion of population living below the upper poverty line between 1991/92 and 1998/99

[2] Based on a poverty line of Cedi 700,000 per adult per year.

(reduction from 50% in 1991/92 to 40% in 1998/99), nearly one-quarter of the population (27%) in 1989-99 was unable to meet their basic nutritional requirement even if they devoted their entire consumption budget to food (Government of Ghana, 2003). Appendix III provides some basic facts and statistics.

## Northern Region

The north of Ghana is generally very flat and sparsely vegetated with large areas of uncultivated bush. The north includes the Guinea savannah regions of Northern, Upper-West and Upper-East, which constitutes over 40% of the total land area of Ghana. Northern Region alone accounts for around 30% of the total land area. The total population of Northern Region is 1.82 million and the population growth rate is 2.8%, marginally higher than the national rate of 2.7%. As mentioned above it is the most sparsely populated region in Ghana. Northern Region's population represents approximately a tenth of Ghana's population. Approximately three out of four persons in Northern Region live in rural areas. Yendi District in which the study was carried out is one of the 13 districts in Northern Region.

Agriculture is the mainstay of the northern economy, with limited manufacturing and services, generally restricted to handicrafts and agro-based processing located around the urban centres of Bolgatanga, Tamale and Wa. The Northern Region is of economic importance to the country since it produces more than a quarter of the national supply of millet, rice and sorghum and more than 80% of the country's peanuts. Much of the agricultural production is small-scale. More than 60% of farms are less than two hectares.

About 69% of the people in Northern Region were classified as poor in 1999 (Government of Ghana, 2003). Disaggregate data on extreme poverty in different regions are not available (for example, Ghana Poverty Reduction Strategy (GPRS)) provides regional data on the upper poverty threshold but no regional data on extreme poverty are available from GPRS[3]). GPRS mentions an extreme poverty figure of 59% in rural savannah areas which include Northern Region as well as Upper East and Upper West Regions. No separate estimate of incidence of extreme poverty is available for Northern Region. However, since the proportion of the population

[3] The 1998/99 Ghana Living Standards Survey (GLSS 4) has derived two nutrition-based poverty thresholds – upper poverty line and extreme poverty line. The poverty thresholds are based on the consumption expenditure needed to achieve minimum nutritional needs. The upper poverty and extreme poverty lines are defined as the consumption expenditures of 900,000 and 700,000 cedis per adult per year respectively.

below the upper poverty level in Northern Region is much lower (69%) than that in the other two regions in the Rural Savannah zone (88% and 84% respectively in Upper East and Upper West regions respectively), it is reasonable to assume that extreme poverty incidence in Northern Region is much lower than in the rest of rural savannah. A reasonable rough estimate is that between 40% and 45% of the population is below the extreme poverty line in Northern Region.

Modes of transport (e.g. cars, buses, minibuses (locally called *trotros*), *Mammy Wagons*[4], trucks, tractors, bicycles etc.) that operate in other parts of the country are also available in the region. It is difficult to find vehicle ownership figures for the area. Field investigations suggest that bicycle ownership is high in Northern Region, possibly because of the preponderance of flat terrain in the region. There are seasonal variations in the operation of transport modes. As many roads become inaccessible in the rainy season, some areas are not served by motorised transport in this season. Roads in Northern Region are generally in bad condition and two-thirds of the feeder road network has been classified as non-maintainable (Tengey et al, 1999).

## Yendi District

Yendi District shares boundaries with seven other districts: Gusheigu/Karaga to the north, Bimbilla and East Gonja to the south, Saboba/Chereponi and Zabzugu/Tatale to the east and Tamale Municipality and Savelugu/Nanton to the west. Yendi District ranks sixth among the 13 districts of the Northern Region in terms of size (land area of 5,350 sq km). The population of the district is approximately 131,000 and the population density is 24 persons/sq km (Yendi District Council, 2003). The district lies within the Volta basin and is generally flat with slight undulations. Yendi District has a number of minor streams draining the area, mainly from the Volta system, which, along with surface dug-outs and boreholes, provide major sources of drinking water for both the people and animals in the district. An overwhelming majority of the population of Yendi district live in rural areas and households are predominantly headed by men. According to one report, female-headed households comprise about 9% of the total (UNICEF, 2001). Yendi, the district headquarters, is situated some 62 km east of the regional capital, Tamale, and is connected to it by an all-weather road.

### 2.1.2 Socio-economic and transport contexts of Moshi Rural District, Kilimanjaro Region, Tanzania

With per capita Gross National Income (GNI) of US$290, Tanzania remains one of the poorest countries in the world. It has an estimated population of 35 million which over its 945,000 sq km land area gives an average population density of 40 people per sq km. The majority of people live in rural areas with 23% of the population living in urban and peri-urban areas. The population growth rate is estimated to be 2.6%.

There are four distinct topographical and ecological areas in Tanzania:

- The Coastal areas (Tanga, Coast, Lindi, Mtwara Regions and the Islands)

[4] A Mammy Wagon is a wooden construction on a lorry chassis used for carrying both goods and passengers. They are popular in rural Ghana.

have a tropical climate with high temperatures and humidity. They receive 1000 to 1900 mm of rain a year. The areas typically grow cashew nuts, citrus fruits, cassava and coconuts.

- The Plateau areas (Mwanza, Kagera, Kigoma, Shinyanga and Tabora Regions) have a cooler climate with low humidity, especially during June to August. Agriculture in these areas is a mixture of arable (sorghum, millet and other staple crops) and livestock.
- The mountainous areas (Arusha, Kilimanjaro and Mara Regions) have a cool climate with temperatures as low as 15°C. These areas receive over 2000mm of rain per year. Agriculture in these areas is a mixture of vegetable crops (such as tomatoes and beans), maize, rice, coffee and a range of other crops and livestock.
- Finally the large central area (Dodoma and Singida Regions) is semi-arid and receive less than 500mm of rain annually. Much of the agriculture in this area is livestock with large numbers of pastoralists, with the main crop being maize with some vegetables

Tanzania with a Human Development Index (HDI) value of 0.407 ranked 162nd among 177 countries. The HDI value of 0.407 is lower than the HDI value of 0.465 for all sub-saharan African countries. Tanzania's economy is highly dependent on agriculture, which accounts for 43% of GDP (World Bank, 2004). Industry accounts for just 17% of GDP and is mainly limited to processing agricultural products and light consumer goods. In recent years, the Tanzanian economy has been doing well with one of the fastest Gross Domestic Product (GDP) growth rates in the region. In 2001/02 GDP grew at a rate of 5.8%.

2000/01 figures show that approximately a fifth of the population (19%) lived below the food poverty line (National Bureau of Statistics, 2002)[5]. The proportion of the rural population below the food poverty line at 20% is only marginally higher than the national figure. In 2000/01, about 36% of the Tanzanian population was below the basic needs poverty line. This figure shows a moderate improvement over the equivalent 1991/92 figure of 39%. The basic needs poverty figure of 39% for the rural population for 2000/01 is slightly higher than the national average.

[5] The poverty line is defined as the expenditure necessary to provide sufficient calories i.e. 2,200 calories per day per person (National Bureau of Statistics, 2002). The basic needs poverty line includes expenditure necessary to provide sufficient calories plus additional expenditure for specified essential items. There is no single expenditure figure for a national poverty line because prices and therefore the poverty line threshold expenditure vary between regions.

Road transport is the dominant mode for the movement of people and goods within the country. Only a small proportion of cargo and passenger movements are by rail. Tanzania borders a number of landlocked countries (e.g. Zambia, Rwanda and Burundi) and so provides a corridor for access to sea ports for them. The total length of the classified road network in Tanzania is estimated at 85,000 km. Of these, approximately 12%, 29% and 56% are trunk, regional, and district and feeder roads respectively.

**Kilimanjaro Region**

Kilimanjaro Region shares borders with Kenya to the east and north, Tanga Region to the south and Arusha Region to the west. Mount Kilimanjaro, the highest mountain in Africa, is situated in the region which has a land area of approximately 13,000 sq km making it one of the smallest regions in Tanzania. According to the 1988 census, Kilimanjaro Region had a population density of 84 persons per sq km, considerably higher than the national average of some 40 persons per sq km. Kilimanjaro is one of the most densely populated regions in Tanzania. Only Dar es Salaam and Mwanza have higher population densities. Population in Kilimanjaro is growing at a rate of 2.1% per annum, a growth rate lower than the national average of 2.6%. Three out of every four people in the region live in rural areas

The region comprises four ecological zones based on altitude, soil and climate – Kilimanjaro mountain peak zone, highland zone, intermediate zone and lowland plain zone. In 1994 the per capita income of Kilimanjaro Region was approximately TZS 56,000 (US$52), ranking eighth among the twenty mainland regions in Tanzania. Maize, paddy, vegetables, beans, cassava, bananas and potatoes are the main food crops produced in the region. The main cash crop is coffee accounting for about a third of the national coffee production. About 11% and 31% respectively of the households in the Region live below the food and basic needs poverty lines. The comparable Tanzania mainland figures are 19% and 36% respectively. The proportion of the population below the food poverty line is far lower in Kilimanjaro than in the country as a whole. Although the proportion of the population below the basic needs poverty line in the region is lower than the national figure, the difference between the regional and national figures is lower.

Cars, large buses, pick-ups, trucks, minibuses (locally known as *Hiace*) and bicycles are the main transport modes in the region as in the rest of Tanzania. It is difficult to find reliable vehicle ownership figures for the Region. Field investigations suggest that there are some variations in vehicle ownership within the Region. For example, bicycle ownership in flat areas is higher than in hilly areas. There are also seasonal variations in the operation of transport modes since many roads become inaccessible by motorised transport during the rainy season.

**Moshi Rural District**

Moshi Rural District is one of the six districts in Kilimanjaro Region. It borders Rombo District in the north, Kenya in the east, Mwanga and Simanjiro Districts in the south and Hai District in the west. While the northern part of the district is mountainous (Kilimanjaro), the southern part is flat. Rainfall is higher at higher altitudes. In some

years the district enjoys two rainy seasons (October to December and March to June).

The land area of the district is 1,713 sq km of which 73% is arable. Approximately 87% of the arable land is under cultivation and agriculture is the major economic activity. Maize, rice, beans, millet and bananas are the major food crops and coffee, cotton, sunflower, and groundnuts are the major cash crops of the area. There is practically no industry in this district. However, there are employment opportunities within the district in the tourism sector. The district has a high population density - 294 persons per sq km. According to the 2002 census, the district has a population of 504,287 out of 2,097,165 for the whole region (24%). The average annual population growth rate is 1.9%.

The district has approximately 657 km of district and feeder roads – an overwhelming majority of them are earthen. Non-motorised transport (mainly bicycles) is popular in the southern part of the district owing to its flat terrain. However, non-motorised transport is hardly found in the north of the district – residents in the northern part depend on motorised transport (mainly minibuses) for making longer trips. Trucks and pick-ups are common for carrying cargo in the harvest season. The main road between Tanga and Moshi (and on to Arusha) provides a good supply of transport (mainly buses or minibuses) to Moshi Town and beyond.

## 2.2 Overall Study Methodology

The following section gives an overview of the combination of qualitative and quantitative methodologies used during the study. Qualitative approaches were used to: (a) inform the design of the household, RP and SP questionnaires; (b) clarify and explore in more depth some of the results from the quantitative analysis, and (c) examine issues such as effective arrangements for administering the questionnaire to children and use of visual aids in the administration of preference questionnaires. Figure 1 below is a flow chart indicating the main steps in the methodology. Details of the qualitative and quantitative methodologies used are given in Sections 2.2 and 2.3 respectively.

### *Selection of study locations*

The choice of study locations is important as the levels of economic activity, transport and modes will affect the results. As described above the two areas chosen for this study were very different - a poor arid and flat area in Ghana and a relatively rich, mixed topography, mixed climate area in Tanzania. The choice of study locations with different characteristics was deliberate to test the methodology in different situations.

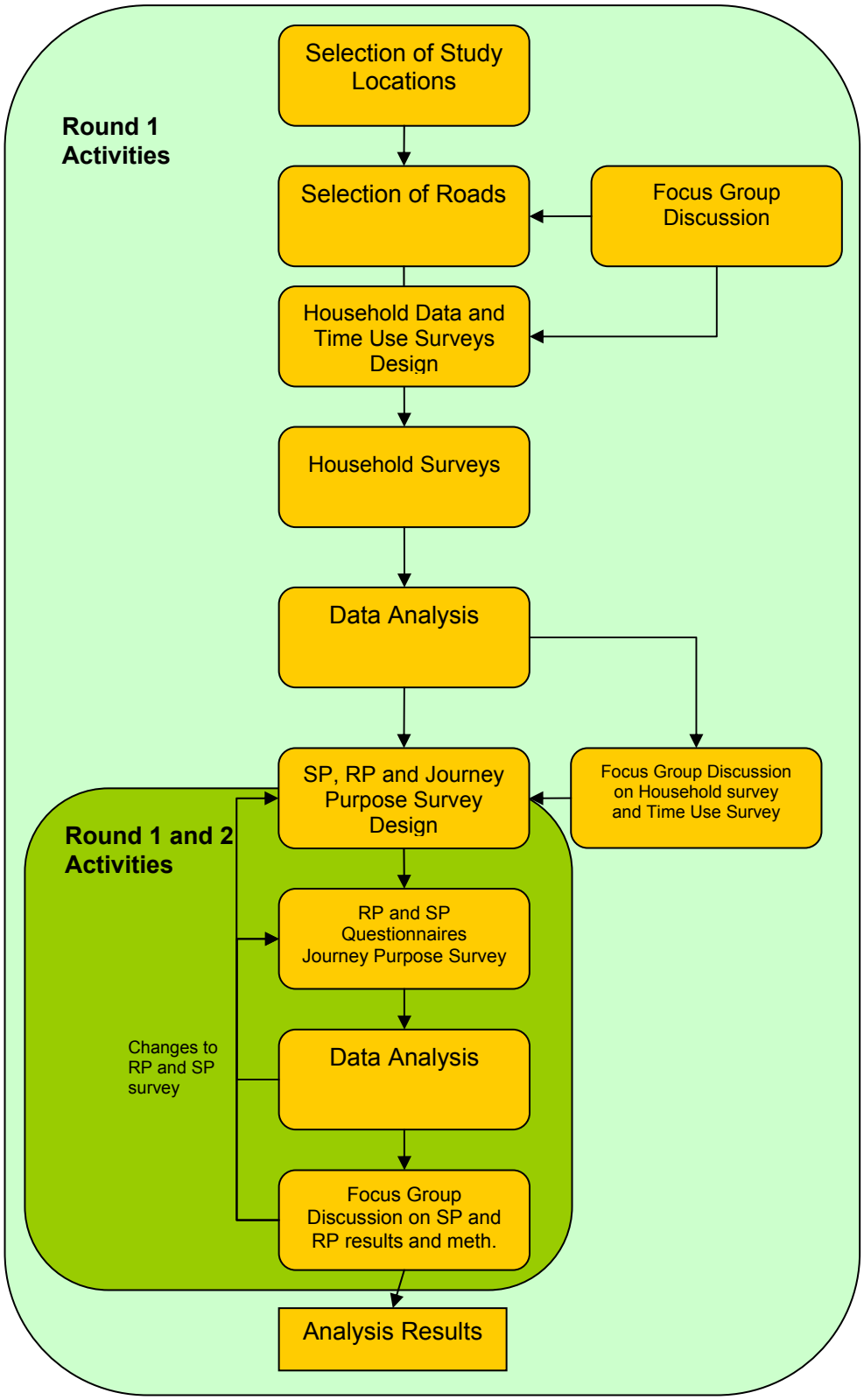



**Figure 1: Schematic diagram of the methodologies and their linkages**

### *Selection of roads*

The selection of roads was again to give a range of conditions for the study. The variables considered for road selection were: (i) road surface (earth, gravel or bitumen); (ii) road condition (poor, fair or good); (iii) availability of transport modes; and (iv) socio-economic activities along the road corridors. Appendix IV provides the selection criteria used for choosing the study roads. District engineers and officials and road users were involved in the selection of the roads. The study chose three roads in each study area to represent a range of conditions. More details on selected roads are provided in Appendix V.

### *Focus group discussions and household survey questionnaire design*

Focus group discussions (FGDs) were held with a cross section of villagers to discuss a range of issues including wealth and poverty indicators and perception of time. Results from these focus group discussions subsequently helped in the design of the household survey questionnaires and preference questionnaires. Details of the focus group discussions are provided below. A sample of the household questionnaire used in the study is provided in Appendix VI. The household questionnaires included questions on: (i) the composition of household size, age and sex; (ii) type and size of household dwellings (whether owned or rented, type of construction and number of rooms); (iii) amount of land owned, leased or rented; (iv) types and amounts of crops produced; (v) ownership of vehicles; (vi) occupation of the household's main earner; (vii) household's cash income sources and number of earners, and (viii) household income and expenditure.

### *Household surveys and data analysis*

Sample surveys of households were required to identify a small number of socio-economic indicators which could be used in the preference questionnaires to estimate the income or expenditure of the households of respondents with an acceptable level of accuracy. After the design of household questionnaires, a number of households were surveyed along different road corridors (see Table 1).

**Table 1: Number of households surveyed in Ghana and Tanzania**

| Country | Number of households |
|---|---|
| Ghana | 116 households along two road corridors |
| Tanzania | 110 households along three road corridors |

The household data analysis results helped in the identification of household indicators on which information could be easily and quickly collected from travellers responding to preference questionnaires at roadside interviews. The indicators identified from the household survey data analysis were subsequently used in the preference questionnaires in order to assess the respondents' socio-economic status, notably the living standard of the respondents' household and whether they can be identified as poor. More details of the analysis methodology are provided in Section 2.3.

### *SP, RP and journey purpose survey design*

After the analysis of the household data, SP, RP and journey purpose questionnaires were designed. Details of the questionnaires and their designs are presented in Section 2.3.

### *SP, RP and journey purpose survey administration*

SP, RP and journey purpose questionnaires were administered through roadside interviews. Section 2.3 presents the number of such questionnaires administered in the two study areas.

### *Data analysis of RP, SP and journey purpose survey*

The next step was the coding of SP, RP and journey purpose data and entering them into the computer in specified formats. These data were then analysed for estimation of travel time saving values and to extract other relevant information.

### *Focus Group discussion on RP and SP results*

Following the analysis of data from the RP and SP questionnaires, mainly after the analysis of the first round of data, focus groups were used to explore results that needed more explanation. In some cases this was also done through semi-structured interviews. The results from these focus group and semi-structured interviews also helped in reviewing the design of different questionnaires, mainly SP questionnaires.

## 2.2.1 Qualitative methodology used in Ghana

This section gives more details of elements of the qualitative methodology used in Ghana to inform the study design and to explain the results of the data analysis.

### Methods used

Fieldwork took place in six communities along three roads in Yendi District. These communities were chosen because they were located along the corridors of the three study roads. The road selection criteria have been discussed earlier. Dry and wet season data were collected in March 2004 and June 2004 respectively.

The qualitative methods used in Ghana were mainly focus group discussions and key informant interviews. However, during some of the FGDs, Participatory Rural Appraisal (PRA) methods were used, including community mapping, activity diaries, time lines, simple ranking and scoring, pair-wise ranking and wealth ranking. Following the selection of roads, a meeting was held with senior members (chief and elders) of each community (Jimli, Kulugini, Chegu, Sagbalgu, Zakpalsi and Sekpe), firstly to seek permission to carry out the fieldwork in the community, and secondly to obtain preliminary road, transport and access data, which were used in the design of the SP and RP questionnaires. A programme of focus group discussions, key informant interviews and household data collection was then drawn up and conveyed to the chairmen of each community so that they were aware of our activities and could organise the men and women for the group discussions. Table 2 elaborates on the type of qualitative methods used and the objectives of their use.

*Key Informant Interviews and Focus Group Discussions*

Initial key informant interviews were carried out with village chiefs and their elders, the village chairperson and women leaders. A series of focus group discussions were carried out with groups of men, women and children. Two types of data were collected during the focus groups: preliminary data and household-related data discussed in the first four focus groups, and time data and SP related data discussed in the second four focus groups. In the first phase of fieldwork, eight FGDs were undertaken with men and women: 4 with women and 4 with men. In the second phase of fieldwork, a further 4 FGDs were carried out, focussing specifically on modal preferences between genders and different socio-economic groups. Further to these, two FGDs were carried out with children (a group of school children and a group of out of school children) to discuss time and time measurement, and transport mode preference. In addition to these discussions, validation meetings were carried out in each of the communities to feedback on our activities and also to confirm initial results. The activities carried out within focus group discussions to elicit particular types of data are described below.

Activity diary

Activity diary surveys were conducted with a small sample of men and women from different socio-economic backgrounds. Six activity diaries were carried out with individuals: one man and woman from poor, medium and wealthy backgrounds. Individuals were interviewed about their typical daily activities in the dry season and then asked how this changed in the rainy season. The results of these interviews were recorded in a log table showing the start, finish and duration of various activities.

Time Line

Time lines, as with activity diaries, were used to get a picture of the daily activities of various groups and individuals (key informants) in the dry and wet seasons. Participants were asked to draw a line on the ground then asked to describe the various indicators they used to identify the time (sun, shadows, temperature etc.). These time indicators were represented by objects or symbols, which were placed along the line to represent a 24 hour period. The participants were then asked to recall the various activities carried out in a typical day in the dry and the rainy seasons. Objects were again used to represent the various activities and placed on the line, indicating the time of the day the activities were undertaken. This activity was time consuming and impractical to do on a large scale and so was limited to one focus group in each community.

**Table 2:Data collection methods (Ghana)**

| SUMMARY OF QUALITATIVE METHODOLOGY | | |
|---|---|---|
| **Type** | **Number** | **Objectives** |
| 1. Semi-structured Interviews | Many | To provide initial information on the study area |
| 2. Focus Group Discussions | 8 | To explore in depth a wide range of subjects, including household structure and wealth groups, drawing from the experiences of small groups of either men or women. The aim was to inform the design of the SP questionnaires and also to provide context to data from the SP and household surveys. |
| 3. Activity Diary | 6 | To gain an understanding of the time people spend on different activities throughout the year. Men and women representing different socio-economic groups (poor, average and wealthy) were asked to participate. |
| 4. Time Line Activity | 2 | To gain an understanding of how people measure and understand time, what indicators people use to tell the time and what activities people undertake on a seasonal basis. |
| 5. Ranking and Scoring | 6 | To understand people's preferences between, for example, different modes of transport. |
| 6. Community Mapping | 2 | To gain an understanding of the village in terms of the services available, access routes into the village and the distances people travel to reach services that are not available within the village. |
| 7. Wealth Ranking | 6 | To gain an understanding of the various socio-economic groups within the area and how these can be identified, for example, through the type of housing structure, number of livestock owned etc. The aim was to support and add context to the data from the household survey. |
| 8. Validation discussions | 4 | To validate the data from the household questionnaire. It was also intended to carry out validation discussions following the analysis of SP data, but this information was not available by the time the team left Ghana. |

Ranking and scoring

The ranking and scoring tools were used to determine the modes of transport most often used as well as participants' preferences under various circumstances. For the ranking and scoring of preferred modes of transport, participants were first asked to list the different modes available to them and place symbols on the ground to represent them. Participants were then given 20 stones and asked to share them among the various modes, giving more to the mode that they use often or prefer most. Pair-wise ranking was also used to elicit participants' preferences. In this

exercise each mode of transport is judged against each of the other modes. The number of times that each mode is chosen indicates their ranking.

Community mapping

The community mapping exercises were done in each of the chosen communities to provide background on the communities. Participants were asked to draw an outline of their community and asked to use symbols or markings to represent various places in their community, e.g. schools, water points, the market etc. on the map.

Wealth ranking

Wealth ranking was used to determine the community members' ability to pay and how the preferences and choices of transport for the different wealth categories differ. The wealth ranking exercise started with a discussion on the participants' perception of wealth and wealth categories in their communities. They were then asked to give criteria for measuring wealth or wealth categories in their communities. Symbols were used to represent the different categories of wealth in the community. Participants then shared 20 stones among the various categories, giving more stones to the category in which more people in the community fall.

Summary findings

Table 3 presents the summary findings of the qualitative surveys in Ghana. Some of the findings are elaborated in the following sections.

Household Data

Through the initial FGDs and key informant interviews, data were gathered on household and village structure and used in the fine tuning the draft household questionnaire. These discussions revealed that, within the area, there is a certain amount of wealth differentiation between individuals and households. This differentiation is evident in a number of ways: (a) the standard of housing (zinc or thatch roofing, cement or mud walls, and cement or mud floors); (b) ownership of transport; (c) ownership of livestock; (d) size of farm and ability to use mechanised as opposed to manual means of farming, and (e) the standard of dress and physical appearance. This information was used to improve the household questionnaire.

Measurement of time

FGDs and interviews were conducted to gain an understanding of how people measure and perceive time. The results were useful in designing the SP and RP questionnaires and are outlined below.

It appears that most people use a combination of physiological, social, mechanical and natural indicators to tell the time.

- Mechanical indicators include the use of watches, clocks and radios.
- Natural indicators include observing the movement of the sun and shadows, moon and stars, and observing or hearing the activities or calls of various birds and animals.

- The physiological indicators include feeling tired, feeling the effects of the heat or feeling hungry.
- Social indicators include observing the activities of others, hearing the call to prayer in the village, interacting with others and asking those who own watches.

**Table 3: Summary qualitative survey findings (Ghana)**

| **SUMMARY OF THE FOCUS GROUP DISCUSSIONS (GHANA)** | | |
|---|---|---|
| **Type** | **Objectives** | **Summary findings** |
| General Background/wealth indicators/household data | To find out wealth indicators, household structures and community composition to develop household questionnaire. Conducted mapping exercise. To find out about local travel and transport options. | Within the area, there is a certain amount of wealth differentiation between individuals and households. This differentiation is evident in a number of ways: (a) the standard of housing (zinc or thatch roofing, cement or mud walls, and cement or mud floors); (b) ownership of transport; (c) ownership of livestock; (d) size of farm and ability to use mechanised as opposed to manual means of farming, and (e) the standard of dress and physical appearance. |
| Time measurement | To find out how people perceive, value and measure time to assist in the design of the SP and RP questionnaires. Conducted time line activity. | People use a combination of physiological, social, mechanical and natural indicators to tell the time. The relative importance of these various indicators is dependent on the age, gender and social position of the person. These discussions revealed that few people measure time, particularly women and the elderly. This potentially posed problems for the relevance of carrying out SP and RP questionnaires, which rely on people being able to understand the western notion of time. However, the consistency of prayer times (between call to prayer, ablutions, prayer and finishing praying etc.), which was revealed through these discussions, allowed the team to redesign the questionnaires using blocks of time |
| Children's value of time | To find out about children's value of time and their transport preferences | The test revealed that children freely responded to questions when they were interviewed alone (without their parents/guardians) but hardly contributed to discussions when their parents/guardians were around. It was therefore concluded that interviewing children together with the parents gave the same response as interviewing the parents alone on behalf of their children. |

The relative importance of these various indicators is dependent on the age, gender and social position of the person.

- **Mechanical Indicators**: Men are much more likely to own and read a watch than women or the elderly. Children were considered to be more conscious of clock time since they were learning it in school. Also, since watches and clocks are comparatively expensive, those with money were more likely to own and use them. Men and wealthy people were much more likely to talk about time in terms of hours than women, the elderly and the poor, who seemed to rely more on natural indicators.
- **Natural Indicators**: People use a combination of the sun and shadows, the movement of the stars and moon and the activities of various birds and animals. The sun and shadows is an obvious tool for estimating time during the day. During the night, people use the movement of the moon and stars to estimate the time. The moon is also used as a calendar to work out the point in the lunar month. During the rainy season, when clouds obscure the sun and moon, people rely more on their internal sense of time, the varying heat of the day (physiological indicators) and the noises of various animals.
- **Social Indicators**: the most important social indicator appeared to be associated with the five daily prayers that are mandatory for all practising Muslims (the predominant religion in the study area). The call to prayer and the prayers that follow provide a regular pattern through which people know the time of day. Those that call the prayers (*Muezzin*) generally use watches and wall clocks so that they can call and start prayers at the correct time. Prayer times therefore play an important role in structuring people's daily activities and their awareness of time.

Influence of time measurement data on questionnaire design

The focus group discussions and interviews on time and time measurement provided an important insight into how people perceive and understand time. This knowledge proved invaluable in the design of the pictorial cards which accompanied a selection of the SP questionnaires. Because of the consistency of prayer times, the blocks of time between call to prayer, prayer, and end of prayer were used to help convey fixed periods of time to some of the SP and RP questionnaire respondents. The 15 minutes between call to prayer and prayer, and the 30 minutes between call to prayer and end of prayers were used to help explain the time differences between the two different options. The questionnaires were designed in such a way as to accommodate multiples of 15 minutes, since it was felt that smaller periods of time would be difficult to explain and difficult for some of the respondents to understand. Interviewers carried a card containing the explanations of different time blocks (Table 4). They were trained to explain the time blocks to the respondents who find it difficult to understand the normal concept of time.

**Table 4: Time block definitions**

| Time Block | Definition |
|---|---|
| 15 minutes | From call to prayer and start of prayers (except morning prayers) |
| 30 minutes (1/2 hour) | From call to prayer and finishing prayers (except morning prayers) |
| 45 minutes | Time between end of 6 o'clock prayers and start of 7 o'clock prayers |
| 60 minutes (1 hour) | Call of morning prayers to start of morning prayers. |

Children's Travel Time

One of the shortcomings of the Bangladesh study was that it did not attempt to value children's travel time savings. Efforts were made to understand the best possible way to capture children's willingness to pay. A number of case study interviews were conducted with boys and girls and group discussions were held. SP questionnaires were also carried out and the study team experimented with a number of different methods to find the best way of interviewing children.

As a test, 15 children travelling alone and 15 children travelling with their parents (or guardians) were interviewed, using the SP questionnaire. In addition, 15 parents travelling were interviewed and asked to answer questions on behalf of their children.

The test revealed that, children freely responded to questions when they were interviewed alone (without their parents/guardians) but hardly contributed to discussions when their parents/guardians were around. It was therefore concluded that interviewing children alone is the best possible way to capture their WTP.

### 2.2.2 Tanzania qualitative informing methodology

Methods used

The qualitative work to inform the design of the quantitative methodology in Tanzania is summarised here with more detailed notes in Appendix VII. The studies were conducted in a number of villages (5) and markets (3) as well as on the roadside with passengers/road users (40). The chosen villages were on and off the study roads to identify possible differences related to access. Investigations at markets were undertaken to obtain insights into the perceptions of traders and customers and were used to validate data from the quantitative analysis discussed in section 2.3. A sample of passengers was chosen to include a good mix of male and female

respondents. A range of methods was used as in Ghana to target a specific area of investigation (Table 5 provides details).

**Table 5 List of focus groups conducted for informing stage in Tanzania**

| Focus group aim | Techniques used and types of group |
|---|---|
| Preliminary road data.<br>To have background data for the design of SP and RP questionnaires. | Semi structured interviews.<br>Village Chairman and Secretary and others.<br>Validation with District Engineer. |
| Perception of time and daily activity to: (a) have better understanding of perceptions and methods for measuring time, and (b) inform the interpretation of results on time budgeting from daily activity data. | Semi-structured discussions.<br>Daily Routine maps.<br>Two male and two female groups from a mixture of backgrounds. |
| Community travel and transport. To give context to the SP and RP design in the types of trips people make and trip purposes. | Area mapping.<br>Transport discussions.<br>Two female and two male groups from a mixture of backgrounds. |
| Wealth and poverty. To validate and given context to results from the household survey and indicators to be used in SP and RP questionnaires. | Wealth ranking.<br>Two mixed groups from different backgrounds. |

The summary findings of the qualitative surveys in Tanzania are provided below.

### *Summary findings*

Perception of time

Two focus groups were conducted, one male group in Makayuni and one female group in Kisange Sangeni, to assess rural residents' perception of time. The results from both groups indicated that people used a number of means to measure time from watches to when the cows come home. In both groups the use of watches and radios to tell the time was prominent. The majority of men and women in the groups could read a watch (analogue). The men were able to differentiate between 5 minute blocks, possibly due to the tight allocation of irrigation water in the area. Whereas women decided they could not easily distinguish between 5 minute gaps but could conceptualise 10 minute time blocks. All could differentiate between blocks of time above 10 minutes. For the design of the SP and RP questionnaires the time blocks were designed so that the time difference between choices offered was not less than 10 minutes. The most universally understandable representation of time within the groups was decided upon as a clock face.

Wealth and Poverty Indicators for the household questionnaire

The initial focus group discussions were used to discuss key indicators of wealth and poverty in the communities. Groups of men and women drew and ranked wealth and poverty indicators. Results were compared and discussed between the groups. While the indicators identified by different groups were similar, there were significant differences in rankings of indicators between men and women. The most common indicators across the groups, in no particular order, were:

- Quality of housing, especially the house roofing and wall materials.
- Number of acres owned and cultivated.
- Number of children at secondary school.
- Method for carrying water (particular to the lowland areas). Richer people can afford to pay cyclists or cart owners to collect water instead of head loading.
- Ownership of transport, primarily bicycles and motorcycles.
- Quality of agricultural tools used.

Some of the above indicators were added to the household questionnaire to test their significance as an indicator of the household consumption levels.

Transport variables for RP and SP questionnaire design

The initial focus group discussions were also used to discuss the key things people think about when making a journey choice. Mixed groups were asked to sketch out a map of the key places they travel to. A discussion was then held on the variables they consider when making these trips. Although price was a significant variable they felt that there was little they could do to influence this so the main issues they consider are comfort and speed. For minibuses there was often some debate on the speed being too fast or too slow. Two groups identified safety as an important variable. Based on this finding a question was included in the SP questionnaire to capture respondents' perception of safe/unsafe traveling conditions.

Interviewing children

A group of secondary school children discussed a number of issues related to travel and transport. The choice of children attending secondary school (i.e. not including children who do not attend school) introduced a bias to the result, but the children who travel the most are likely to be those attending school. It was apparent that children have little influence on their mode of transport and the paying of fares. Their parents make the majority of the decisions. However, they appreciated the amount of money their parents paid and apparently knew the worth of money. Secondly they knew when money was tight as they would have to walk instead of going by bus. The issue of a student fare was raised by the children indicating awareness of costs and value of money. The evidence suggested that children have sufficient understanding of money and time to make choices involving trade-offs and justified the administration of the SP questionnaire directly to the children.

Use of visual aids

Over 15 interviews were conducted with a range of persons representing men and women, young and old, poor and relatively better off to elicit their views on visual aids to be used during the surveys. This was an important issue because during the first round of SP questionnaires significant differences were found between the responses of those interviewed with and without visual aids. People were either interviewed post SP interview about their experience or offered the SP options with and without the visual aids. A small focus group was also held with the enumerators to gain their views on the use of visual aids and interviewee responses. There was a range of responses to the visual aids (pictures on cards). The most common responses included:

- 'The pictures made you think about the situation.' – a young woman in Umbwe.
- 'They make no difference.' – a young man in Himo.
- 'I was not sure what they meant, but going through it again I understand.' – a middle aged man in Kisange Sangeni.
- 'The pictures could be bigger for old people.' – an old man in Himo.
- 'It is easier to understand with the cards, especially for older or younger people who may not read.' – a middle aged woman in Umbwe.

Observations included:

- People took longer to answer questions when using visual aid cards. This may be attributed to the time taken to comprehend the visual evidence presented or that respondents could not see the other questions. In contrast, without visual aids, after a certain point people provide quick responses to the options on the questionnaire with insufficient thought.
- A small minority of people simply did not understand the options, with or without the cards.
- People provided visual signs that they were thinking more when using the cards, such as looking up, hesitating when answering and talking their answer through often pointing at the elements on the cards on which their dilemma was based.

The overall conclusion is that visual aids do aid the decision making process by enhancing the understanding of options as well as improving the decision making process interviewees go through. However, there are improvements that can be made to the visual aids (e.g. use of bigger and better pictures).

### 2.2.3 Comparison of qualitative methodologies used in Ghana and Tanzania

Previous sections have discussed the qualitative methodologies used in Ghana and Tanzania and how they have helped in the design of household and preference questionnaires and an increased understanding of the choice of transport modes.

The methodologies used in the two countries are briefly compared here and broader lessons have been drawn.

The methodology in Ghana was much broader than in Tanzania and could be described as a more typical PRA using the whole range of techniques to obtain information relevant for developing the questionnaires and for validating results. The methodology used in Tanzania was more focused and was designed specifically around getting the results to input into the design of the questionnaires. There are advantages to both the approaches. If time and budgets are constrained it is felt that the more direct and specific approach is appropriate, with little reduction in the quality of the data as long as the investigators are clear about their focus and a good rapport is developed with the participants and respondents.

Both approaches gave data that was essential for the design and administration of the questionnaires. For example, understanding rural people's concept of time helped in the design of SP experiments in both Ghana and Tanzania. Safety as a travel attribute was included in the questionnaire in Tanzania following FGD. Qualitative data also helped in the explanations of some of the results (see Sections 4.1 and 4.2).

The main broad lessons learnt are that (a) the use of qualitative techniques should go hand in hand with the use of quantitative techniques, (b) knowledge of and ability to use a range of qualitative approaches is needed, and (c) there should be flexibility in choosing the range of qualitative approaches that are most appropriate in the local context.

## 2.3 Quantitative Methodologies

The quantitative approach involved the use of 9 and 8 types of questionnaires respectively in Ghana and Tanzania. There were three main categories of questionnaires - household level questionnaire administered at the homes of respondents; SP and RP questionnaires administered at the roadside; and travel purpose questionnaires, also administered at the roadside. Appendix VIII provides detailed information about the different types of questionnaires used in Ghana and Tanzania along with the objectives for their use.

Samples of the household, SP and RP, and the travel purpose questionnaires are attached in Appendix VI. Appendix IX provides the actual values and choices offered in different SP questionnaires. These values are generated following SP experimental choice design procedures. IT Transport (2002) sets out the step-by-step procedures for the experimental design.

### 2.3.1 Use of household data in the identification of poor and non-poor travellers

Household surveys were conducted in two study areas along the study road corridors. Household surveys mainly collected information on the households' basic parameters (e.g. household size and composition) and economic characteristics

(income and expenditure) (see Appendix VI). IT Transport (2002) and Vaidya and Ahmed (2004) provide details of the methodology developed as a part of the Bangladesh study. The household surveys were conducted to collect data for identifying indicators which could be used in the preference questionnaires to assess the socio-economic status of the respondent and especially whether the respondent could be categorised as poor or non-poor. The indicators should be chosen to ensure that respondents to preference questionnaires would be willing and able to provide the relevant information. Econometric techniques were used to analyse the household survey data to identify the variables which explain household expenditure and to estimate their co-efficient values. The identified indicators were subsequently used in the preference questionnaires to differentiate the responding travellers on the basis of their socio-economic status. As mentioned above, data from 116 and 110 households were collected in Ghana and Tanzania respectively.

Table 6 shows the independent variables used in the econometric analysis. The dependent variable in both cases was the total yearly household “expenditure” representing the standard of living of respondents’ households. Household “expenditure” consists of two elements: expenditure in cash and “expenditure” in kind calculated from the amount of produce a particular household consumed in the last twelve months and the market prices of the produce. Table 6 shows that in Ghana the significant variables that explain the total yearly household consumption are: (a) number of household members engaged in meaningful income earning activities; (b) total land area available to the household; (c) number of goats/sheep owned by the household; (d) at least one member of the household engaged in permanent off-farm income earning activities, and (e) at least one member of the household engaged in an established business. In Tanzania all the variables found to be significant in Ghana with the exception of the number of goats/sheep and the dummy variable for a household member engaged in an established business were found to be significant. In addition, two other variables (households with permanent building structure and a dummy for households with motorised transport) were significant in explaining differences in household expenditure levels.

It was surprising that in Ghana the number of cattle owned by the household was found to be insignificant while the number of goats/sheep was significant. Household survey data showed that approximately one out of four and three out of four surveyed households owned cattle and goats/sheep respectively. Field investigations suggest that in the Northern Region in Ghana cattle are seen as property of the extended family rather than the immediate household and proceeds from the sale of cattle are mainly used for exceptional expenditures relating to social obligations (e.g. funerals). UNICEF (2001) also found that a high percentage of cattle are sold to finance social events such as funerals. On the other hand goats/sheep are sold more frequently to raise cash for normal household expenditure (e.g. to buy food, to buy agricultural inputs etc.). UNICEF (2001) also reported that the proportion of households selling goats/sheep is considerably higher than the proportion of households selling cattle.

While, in the case of Tanzania the type of house construction material was a significant explanatory variable for total household expenditure it was not the case in Ghana. An overwhelming majority of the homes of surveyed households in Ghana had mud walls and thatched roofs. Only 13% had mud walls and CI sheet roofs. Extreme weather conditions (the temperature may rise well over $40^0$C during the summer) in the Northern Region may be the reason for the wealthier households not using non-traditional construction materials. A house with brick walls and a CI sheet roof may be unliveable during the summer.

**Table 6: Independent variables used in Ghana and Tanzania**

| Ghana | | Tanzania | |
|---|---|---|---|
| **Independent variables** | **Form and additional information** | **Independent variables** | **Form and additional information** |
| **Number of persons engaged in meaningful income earning activities (NOOCCU)** | Continuous | **Number of persons engaged in meaningful income earning activities (NOOCCU)** | Continuous |
| **Total Land area (acres) (TOTLAND)** | Continuous | **Total Land area (acres) (TOTLAND)** | Continuous |
| Number of cattle | Continuous | Number of cattle | Continuous |
| **Number of goats/sheep (NOGOATS)** | Continuous | Number of goats/sheep (NOGOATS) | Continuous |
| Total number of bicycles in the household (BIKETOT) | Continuous | Not used | |
| **At least one household member engaged in "permanent" off-farm employment (D_P_JOB)** | Dummy | **At least one household member engaged in "permanent" off-farm employment (D_P_JOB)** | Dummy |
| **At least one household member in an established business (D_TRAD)** | Dummy | At least one household member has an established business (D_TRAD) | Dummy |
| Household with CI sheet roofing (D_CI_ROOF) | Dummy | **Household with permanent structure (D_P_CON)** | Dummy |
| Ownership of motorised vehicle by household (D_T_MOT) | Dummy | **Ownership of motorised vehicle by household (D_T_MOT)** | Dummy |
| Sex of household head (D_SEX) | Dummy | Sex of household head (D_SEX) | Dummy |

Note: The variables in **bold** were found to be statistically significant explanatory variables.

Although in Ghana the households with an established business came out as a significant indicator in explaining total household expenditure, this was not the case in Tanzania. Conversely, while the ownership of motorised transport was a significant

factor in Tanzania, it was not significant in Ghana. No obvious plausible explanation could be found for this difference between Tanzania and Ghana.

Table 7 presents the coefficients of the significant explanatory variables and Eq. (i) and Eq. (ii) provide the final linear model expressions used to estimate total yearly household expenditure of roadside respondents in Ghana and Tanzania respectively.

**Table 7: Coefficients of significant variables (Ghana)**

| Ghana [a] | | Tanzania[b] | |
|---|---|---|---|
| **Variables** | **Coefficients** | **Variables** | **Coefficients** |
| NOOCCU | 748,028 | NOOCCU | 104,130 |
| TOTLAND | 220,168 | TOTLAND | 81,859 |
| NOGOATS | 274,143 | (D_P_JOB) | 522,410 |
| (D_P_JOB) | 7,209,735 | D_T_MOT | 309,144 |
| (D_TRAD) | 6,989,506 | D_P_CON | 214,770 |

Notes: **[a]** F-value of the model = 59.7 and Adjusted $R^2$ = 0.717; all values in Cedi.
**[b]** F-value of the model = 54.7 Adjusted $R^2$ = 0.709; all values in TZS.

TOTEXP(GHA) = 220,168 xTOTLAND + 748,028x NOOCCU + 274,143xNOGOATS + 7,209,735xD_P_JOB + 6,989,506xD_TRAD..……(i)

TOTEXP(TAN) = 81,859xTOTLAND +104,130 x NOOCCU + 522,410xD_P_JOB + 309,144xD_T_MOT+ 214,770xD_P_CON..……..(ii)

### 2.3.2 Revealed preference, stated preference and travel purpose surveys

Table 8 lists the number of different types of questionnaires administered in the two rounds and Appendix VIII sets out details on the purposes and use of these questionnaires, along with the place of their administration and the types of data collected through them, Appendix VI shows the sample questionnaires. Appendix IX provides the actual values and choices offered in different SP questionnaires. Apart from household and preference questionnaires, a travel purpose questionnaire was also administered. The objective of this questionnaire was to supplement the travel purpose data already collected as a part of the preference data in order to understand the respondents' travel purposes.

**Table 8: Number of different questionnaires administered**

| Questionnaire | Ghana | | | Tanzania | | |
|---|---|---|---|---|---|---|
| | **Round 1 (Dry) [a]** | **Round 2 (Wet) [b]** | **Total** | **Round 1 (Dry) [c]** | **Round 2 (Wet) [d]** | **Total** |
| RP | - | 405 | 405 | - | 370 | 370 |
| SP 1 | 140 | 136 | 276 | 148 | 150 | 298 |
| SP 2 | 131 | 141 | 272 | 150 | 150 | 300 |
| SP 3 | 123 | 142 | 265 | 150 | 150 | 300 |
| SP 4 | 127 | 141 | 268 | 150 | 150 | 300 |
| SP 5 | 144 | 140 | 284 | 150 | 150 | 300 |
| SP 6 | 126 | 141 | 267 | n/a | n/a | n/a |
| Travel Purpose | 917 | 843 | 1760 | 585 | 434 | 1019 |

Notes: **[a]** – March 2004; **[b]** June 2004; **[c]** August 2004; **[d]** Dec. 2004

## 2.4 SP and RP Data Analysis Strategies and Model Estimation

The collected SP and RP data were coded and entered into the computer and relational databases were developed to aid the analysis. For the analysis of preference data, linear utility models of the following form were developed to decompose the overall preference responses into part utilities attached to each attribute:

$$U_i = C_i + \sum a_i * x_i + \sum b_i * d_i * x_i$$

Where $U_i$ = Utility of option i;

$C_i$ = Constants to capture effects of subtle attributes (e.g. inclination towards use of any particular mode);

$x_i$ = travel attributes (e.g. IVT, WLKT and fare);

$d_i$ = dummy variables (e.g. male vs. female, poor vs. non-poor etc.);

$a_i$ = model coefficients for continuous variables; and

$b_i$ = model coefficients for discrete (dummy) variables.

The model coefficients were used to estimate the base travel time saving values and other attribute values. Sections 4.1 and Section 4.2 discuss the significant and insignificant coefficients and the values of the significant coefficients.

RP and SP data from both rounds were first analysed separately to assess the suitability of RP data. This strategy was adopted as the Bangladesh study showed that the RP approach was not suitable for valuing rural travel time savings in developing countries. In the case of both Ghana and Tanzania again the RP approach was found to be unsuitable (see Section 4.3 for details). Therefore, the RP data were not included in the final analysis (i.e. only SP data from both rounds were used in estimating the value travel time savings). SP data from different SP experiments were combined and analysed using the Hierarchical Logit (HL) modelling concept. The final tree structures were like the ones in Figure XI-1 and Figure XI-2 in Appendix XI.

## 2.5 Summary of the Chapter

The first part of this chapter provided a brief outline of the socio-economic and transport characteristics of the study areas in the context of the national situation. The study areas were chosen to reflect very different characteristics. Yendi District in Northern Region in Ghana is hot and arid and relatively poor with a low population density. While Tanzania is among the poorest countries in the world, Moshi Rural District is in a relatively prosperous and densely populated part of the country.

The chapter then goes on to explain the overall study strategy and the combination of qualitative and quantitative methodologies used. A range of qualitative approaches, including some participatory appraisal tools have been used to inform the design of the quantitative parts of the study and to interpret the results. The household surveys and econometric studies to develop models to estimate the living standards of roadside interviewees are then described and finally the preference approaches used have been outlined.

# 3. THRESHOLD EXPENDITURES, TRAVELLERS' LIVING STANDARDS, PURPOSE OF TRAVEL & ACTIVITY PATTERNS

Evidence from developed countries indicates that travellers with higher incomes have higher time saving values. Studies in the UK and Netherlands show that the income elasticities are approximately between 0.5 to 0.8 (Institute for Transport Studies, 2003). Conclusions from the Bangladesh study were not entirely consistent with the developed country evidence. In Bangladesh, households with permanent jobs and businesses typically had higher than average incomes. Their time saving values were also higher than average. This result is broadly consistent with results from developed countries. However, for travellers identified as being from poor households, the VoT was higher than the average. The counterintuitive result for poor travellers may be explained by the very tight time budget of the poor in Bangladesh. The poor need to devote more time to income earning and subsistence activities to meet basic household needs. Arguably, the higher value of time savings can be explained by the WTP more to reduce unproductive travel time.

In the light of the Bangladesh result, it was thought important to examine the relationship between household income and VoT and especially whether a difference could be identified between the travel time saving values of travellers from poor and non-poor households in the Africa studies. Also to put VoT results in a proper context it is necessary to understand the purpose of travel in rural areas and the activity patterns of men and women with different living standards. This chapter presents the methodology for identifying respondents' living standards and the results of the travel purpose and activity pattern analysis. The evidence has been used in developing the preference questionnaires and interpreting travel time saving values.

## 3.1 Threshold Per Capita Expenditure and Identification of Respondents' Living Standards

As noted above, one of the objectives of the studies was to estimate the WTP to save travel time for travellers from poor and non-poor households. Since preference interviews had to be completed quickly as they were conducted at the roadside or in-vehicle, it was impractical to collect reliable information on income and expenditure levels from travellers at such interviews. There were also several other problems concerning the collection of income and expenditure data from roadside interviews (see Vaidya and Ahmed, 2004 for more details).

The study used household data collected before the start of the preference surveys to estimate the total household expenditure of the respondents. The methodology used regression analysis to identify a small number of socio-economic indicators which, taken together, were sufficiently good predictors of household expenditure (see section 2.3.1 for details). The indicators were chosen to ensure that the necessary information could be readily and reliably obtained within a short space of time from travellers during the roadside or in-vehicle preference interviews.

The next step was to identify the thresholds for distinguishing between poor and non-poor households. The Bangladesh study utilised the World Bank international poverty level thresholds. There are two such threshold figures - a lower one of US$1 per person per day and a higher one of US$2 per person per day. These thresholds are based on 1985 purchasing power parity (PPP) estimates. The 1985 figures were revised in 1993 to US$1.08 and US$2.15 respectively. In the Bangladesh study, the resulting thresholds were corroborated by evidence from a recently completed cost of basic needs study. The applicability of the World Bank thresholds was tested in the Africa studies. Table 9 presents the calculated per capita figures for upper and lower World Bank thresholds for Ghana and Tanzania. Current exchange rates and ratios of PPP and nominal GNP figures were used in the calculations (see IT Transport, 2002, and Vaidya and Ahmed, 2004 for more details).

**Table 9: Poverty threshold levels in local currency**

| Country | Exchange Rate | Ratio of PPP and Nominal Gross National Product (GNP) | US$1.08 equivalent figure in PPP (col. 2)x365x1.08/(col. 3) | US$2.15 equivalent figure in PPP (col. 2)x365x2.15/(col. 3) |
|---|---|---|---|---|
| Col. 1 | Col. 2 | Col. 3 | Col. 4 | Col. 4 |
| Ghana | 1 US$=8915 Cedi | 7.41 **[a]** | 474,430 Cedi | 948,859 Cedi |
| Tanzania | 1 US$=1,075 TZS | 1.98 **[b]** | 214,113 TZS | 427,226 TZS |

Notes: **[a]** GNP (nominal) and GNP (PPP) calculated at US$5.40 billion and US$40.0 billion respectively by World Bank (2003).
**[b]** GNP (nominal) and GNP (PPP) calculated at US$9.60 billion and US$19.0 billion respectively by World Bank (2003)

Household expenditure per capita for the households of preference survey respondents estimated from the socio-economic indicators equations (see Section 2.3.1) were compared with the World Bank thresholds to derive the proportions of households falling below the upper and lower thresholds in Ghana and Tanzania (see Table 10). The proportions of respondents from households falling below the lower threshold level in Ghana and Tanzania are 8.4% and 89% respectively. While the Ghana figure seems to be abnormally low, the Tanzania figure seems very high.

**Table 10: Proportion of preference survey respondents below upper and lower poverty thresholds**

| **Country** | **Proportion below lower threshold ($1.08 PPP)** | **Proportion below upper threshold ($2.15 PPP)** |
|---|---|---|
| Ghana | 8.4% | 65% |
| Tanzania | 89% | 98% |

Official publications in Ghana do not provide figures that relate to the international poverty threshold levels. Government of Ghana (2003) provides country wide poverty figures based on two poverty thresholds – upper poverty threshold (consumption expenditure of Cedi 900,000 (US$100) per adult per year) and extreme poverty threshold (consumption expenditure of Cedi 700,000 (US$78) per adult per year).

When the Government of Ghana (GoG) extreme poverty threshold figure is used in the identification of the poor, 37% of the preference survey respondents fall below this threshold. In section 2.1.1, it was concluded that between 40 and 45% of the population in Northern Region was probably below the extreme poverty line. The estimated poverty incidence of 37% for the respondents is not far from this range. Therefore, it seems reasonable to use the threshold expenditure figure of Cedi 700,000 per capita per year to distinguish between respondents from poor and non-poor households in Ghana.

As noted above, the proportions of respondents below the two international poverty thresholds were very high in Tanzania. This might be because of problems with PPP or nominal GNP estimates (PPP to nominal GNP ratios for Tanzania and Ghana are 1.98 and 7.41 respectively). No national poverty threshold figures for Tanzania could be found at the time of the study[6]. National Bureau of Statistics (2002) provides national and regional poverty figures based on the Household Budget Survey 2000/01. It defines two poverty lines – food and basic needs poverty lines. The food poverty line (the lower poverty line) is defined as the expenditure necessary to provide 2,200 calories per day. The basic needs poverty line includes expenditure necessary to eat sufficient calories plus expenditure on other essential items. These poverty threshold figures are different for different regions as the price of food and other items vary among regions.

In the absence of national poverty thresholds, the study has used the "self perception method" to identify poor and non-poor respondents. This is a subjective method and as the term suggests self perception of respondents on how well the household's food requirements over the year were satisfied was used. Households were categorised into four groups: 'chronic deficit', 'occasional deficit', 'break even' and 'surplus'. This method is quite common in the analysis of poverty in developing countries, especially in Bangladesh (Hasan and Iglebaek, 2004). The method defined poor respondents as those whose households' were unable to meet their yearly food requirements (i.e. they either face chronic or occasional food shortages over the year). It implicitly assumes that the poor are unable to meet their basic food requirements even if they devoted their entire consumption budget to food. This method can be considered to be in line with the food poverty line defined by the National Bureau of Statistics (2002).

A question on the households' food security was included in the Tanzania preference questionnaires. The initial reason for including this question was to assess the effectiveness of the qualitative approach in identifying respondents' living standards. Results of the analysis show that approximately 34% of the respondents can be classified as poor using the self perception method. National Bureau of Statistics (2002) provides figures of 23% and 38.7% of the rural population in Tanzania below food poverty line and basic needs poverty line respectively. The estimate of the

[6] Since the completion of the study the authors have been made aware of a poverty baseline report (National Bureau of Statistics and Oxford Policy Management, 2000) which would have been relevant.

proportion of the poor respondents in the study appears to be broadly consistent with the National Bureau of Statistics figures.

### 3.2 Travel Purpose

The Bangladesh study included travel purpose surveys to assess whether a distinction could be made between working and non-working journeys for rural travellers and whether a substantial proportion of their journeys were multi-purpose. The conclusion from the Bangladesh study was that working and non-working trips in rural areas of Bangladesh could, indeed, be differentiated. However, only a small minority of the rural trips in south west Bangladesh could be classified as conventional work trips. This proportion rose to 3.5% if self employed workers were included. In addition, a substantial proportion of trips (roughly 18%) in rural Bangladesh were for the purpose of buying and selling goods for profit. When these trips were included under the work trip category the proportion rose to approximately 21%.

The African studies also included travel purpose surveys. A total of 2,879 travellers (1,760 persons in Ghana and 1,019 persons in Tanzania) were interviewed to collect journey purpose information. Journey purpose related information was also extracted from the preference questionnaires. Results of the analysis of the collated information from the travel purpose surveys and the preference questionnaires are presented below.

Table 11 presents the overall and gender disaggregated travel purpose breakdown under three broad categories. While in Ghana only about one out of three trips are to meet wider socio-economic needs, in Tanzania two out of three trips fall in this category. The aggregate figure is about one out of two trips. An interesting finding from Table 11 is that the proportions of trips made by men and women under the three broad categories are broadly similar, though the proportions of trips made by women for basic need purposes were slightly higher than by men.

Table 12 presents the proportions of travel purposes under the broad category of wider socio-economic needs. In Ghana four out of ten trips under this broad category were made for buying and selling goods for profit. The figure is approximately one out of two trips for women. Other prominent trip types under this broad category in Ghana are: (a) trips to educational institutions (13%); (b) trips made for household wider agricultural needs (17%), and (c) trips to health facilities (8%). In Tanzania no particular trip purpose dominates under wider socio-economic needs. The main trip purposes under the broad category being: (a) commuting (20%); (b) trips to markets for purchase of goods (13%), and (c) trips to health facilities (13%). About 1% and 9% of the trips respectively under this category can be classified as conventional work trips.

**Table 11: Overall and gender disaggregated purpose of travel**

| | Ghana | | Tanzania | | Overall |
|---|---|---|---|---|---|
| **Overall** | Nos | % | Nos | % | |
| Household Basic Needs[7] | 1,870 | 49% | 434 | 17% | 37% |
| Household Wider Socio-Economic Needs[8] | 1,135 | 30% | 1,565 | 62% | 43% |
| Social and Leisure[9] | 790 | 21% | 518 | 21% | 21% |
| **Overall male** | | | | | |
| Household Basic Needs | 1,082 | 47% | 229 | 16% | 35% |
| Household Wider Socio-Economic Needs | 704 | 30% | 917 | 64% | 43% |
| Social and Leisure | 530 | 23% | 284 | 20% | 22% |
| **Overall female** | | | | | |
| Household Basic Needs | 788 | 53% | 205 | 19% | 39% |
| Household Wider Socio-Economic Needs | 431 | 29% | 648 | 60% | 42% |
| Social and Leisure | 260 | 18% | 234 | 22% | 19% |

Table 13 and Figure 2 present the proportion of overall trips that can be categorised under different work categories. Less than 1% of trips in Ghana can be classified as work trips according to the conventional definition (i.e. trips undertaken on employer's business). In Bangladesh also the proportion of conventional work trips was found to be less than 1%. The figure for conventional work trips is 5.6% in Tanzania. The higher conventional work trips figure in Tanzania possibly reflects higher formal employment in the tourism sector in the Kilimanjaro Region. When conventional work trips are added to self-employment related trips, the proportions of work trips become 1% in Ghana, 11.5% in Tanzania and 5.2% overall. The comparable Bangladesh study figure of 3.5% has been mentioned above. Again when work and self-employment related trips are added to trips made for buying and selling of goods for profit, the proportion of these trips increases to 13.6% for Ghana, 18.5% in Tanzania and 15.5% overall for the two countries. The comparable Bangladesh study figure was 21%.

[7] Travelling in relation to households' basic needs. This includes travelling in relation to basic household activities (like water collection, firewood collection, grain grinding) and basic agricultural activities (ploughing, planting, weeding, harvesting)

[8] Travelling in relation to households' wider socio-economic needs. This includes, amongst others, travelling for access to socio-economic facilities (like markets, economic institutions, educational institutions, health centres etc.), commuting, work related travel etc.

[9] Travelling for social and recreational purpose (like visiting friends and relatives, going to cinema, theatres etc.)

**Table 12: Disaggregated purpose of travel for wider socio-economic needs**

| | Ghana | | | Tanzania | | |
|---|---|---|---|---|---|---|
| | Overall | Male | Female | Overall | Male | Female |
| | % | % | % | % | % | % |
| Household wider agricultural needs | 17% | 23% | 8% | 5% | 6% | 3% |
| For purchasing/selling of goods for profit[10] | 42% | 35% | 53% | 11% | 12% | 10% |
| Travel to go to health facilities | 8% | 7% | 8% | 13% | 9% | 18% |
| Travel to go to Educational institutions | 13% | 15% | 10% | 12% | 12% | 14% |
| Travel to go to market for purchase (non-profit) | 7% | 6% | 8% | 13% | 8% | 19% |
| Travel to go to administrative centres (e.g. District HQs government offices, post office etc.) | 3% | 3% | 3% | 5% | 6% | 4% |
| For going to economic facilities (e.g. banks) | <1% | 0% | 0% | 1% | 1% | 1% |
| For going and coming from work place | 3% | 2% | 6% | 20% | 21% | 18% |
| Travelling while working for an employer | 1% | 1% | 1% | 9% | 11% | 6% |
| Self employed travelling while working | 3% | 3% | 2% | 10% | 12% | 7% |
| To satisfy other socio-economic needs | 3% | 5% | 2% | 2% | 2% | 1% |

The Bangladesh study argued in favour of redefining work related trips that have opportunity costs of lost time equal to the marginal value of income of the travellers in a developing country rural context. The redefined work trips include trips made in the course of work for an employer, trips made in the course of work as self employed, and trips made for purchasing/selling of goods for profit. The proposed redefinition is also valid in the African context. Time saving values of these trips should be equal to at least the relevant wage rates.

**Table 13: Proportion of trips made for work related purposes**

| Ghana | Male | Proportion of work trips | Proportion of work and self employed trips | Work, self employed plus trips for buying and selling for profit |
|---|---|---|---|---|
| Ghana | Male | 0.2% | 0.7% | 16.0% |
| | Female | 0.3% | 1.3% | 12.0% |
| | Overall | 0.3% | 1.0% | 13.6% |
| Tanzania | Male | 7.1% | 14.5% | 13.5% |
| | Female | 3.5% | 7.5% | 22.3% |
| | Overall | 5.6% | 11.5% | 18.5% |

[10] A shopkeeper going to market to purchase goods or a petty trader going to market to buy or sell goods.

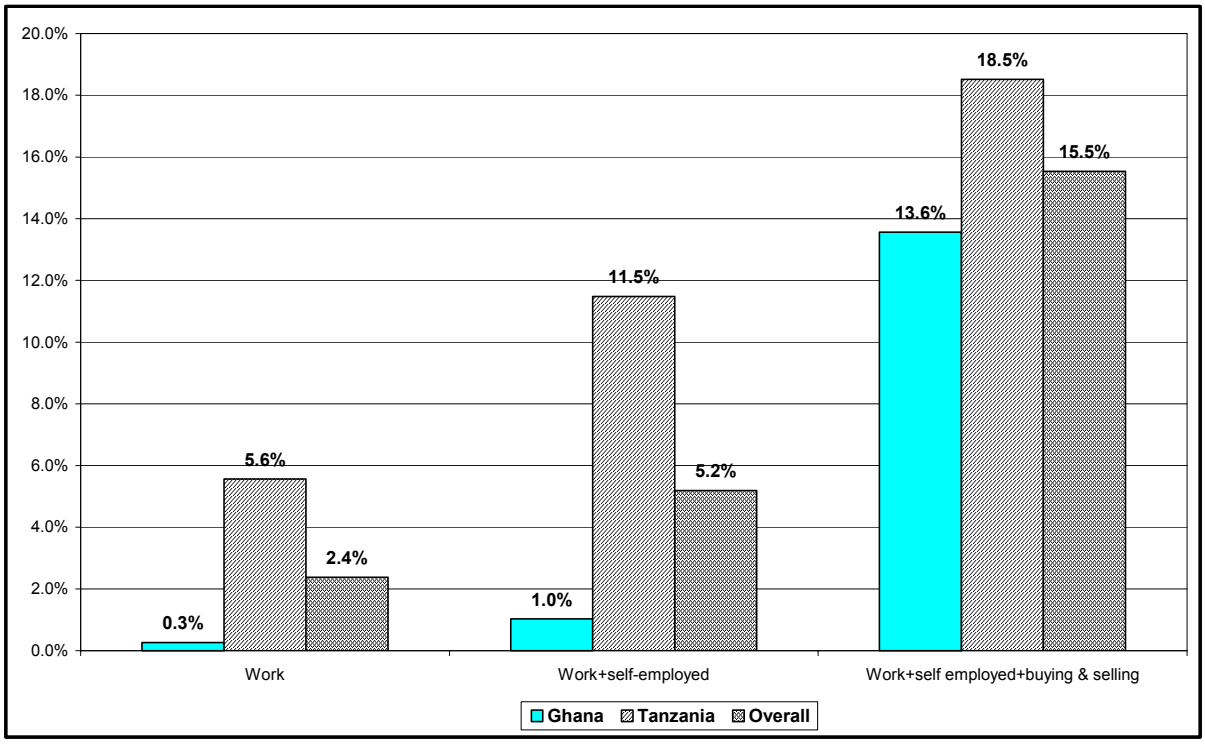



**Figure 2: Proportion of trips for work related purposes**

The conventional view is that a substantial proportion of trips made by rural travellers have multiple purposes and that this makes valuing travel time saving more complex. For example, visit to a market may involve both economic (selling a produce) and leisure (meeting friends and relatives) purposes. Table 14 shows the proportions of trips made for single and multiple purposes. In Ghana just over one out of five trips was made for more than one purposes. This figure was higher in Tanzania – two out of five trips. Proportionately trips with "social and leisure" as the main travel purpose have less multiple purposes. No striking differences emerged between men and women, though in Ghana women made proportionately more multi-purpose trips and in Tanzania men made more multi-purpose trips.

Figure 3 presents the Ghana, Tanzania and overall proportions of single and multi-purpose trips. The average proportion of multipurpose trips for the two countries is 29%. This figure is considerably higher than the Bangladesh figure of 14%. The difference is in line with other studies of trip patterns of rural residents in Asia and Africa (Ahmed, 1997; Dawson and Barwell, 1993). Rural residents in Bangladesh were found to have made frequent but shorter trips than their African counterparts. An average person in rural Bangladesh made 8.5 trips per day of 0.8 km average length taking an average time of 8.4 minutes. Dawson and Barwell (1993) show that comparable figures for the number of trips in Ghana and Tanzania are 1.0 and 1.1 respectively and comparable time per trip are 69 minutes and 75 minutes for Ghana and Tanzania respectively. The lower frequency of trips and their greater length in Africa largely account for the higher proportion of multi-purpose trips in Ghana and Tanzania than in Bangladesh.

**Table 14: Single versus multiple purpose trips**

| Main Travel Purpose | Country | Proportion of trips that have more than: | | | | | |
|---|---|---|---|---|---|---|---|
| | | One purpose (%) | More than one purpose (%) | One purpose (%) | More than one purpose (%) | One purpose (%) | More than one purpose (%) |
| | | Male | | Female | | Overall | |
| Overall | Ghana | 81% | 19% | 73% | 27% | 78% | 22% |
| | Tanzania | 58% | 42% | 62% | 38% | 60% | 40% |
| Basic Household Needs | Ghana | 79% | 21% | 68% | 32% | 75% | 25% |
| | Tanzania | 61% | 39% | 61% | 39% | 60% | 40% |
| Households' Wider Socio-Economic Needs | Ghana | 82% | 18% | 78% | 22% | 80% | 20% |
| | Tanzania | 55% | 45% | 60% | 40% | 57% | 43% |
| Social and Leisure | Ghana | 84% | 16% | 81% | 19% | 83% | 17% |
| | Tanzania | 69% | 31% | 71% | 29% | 70% | 30% |

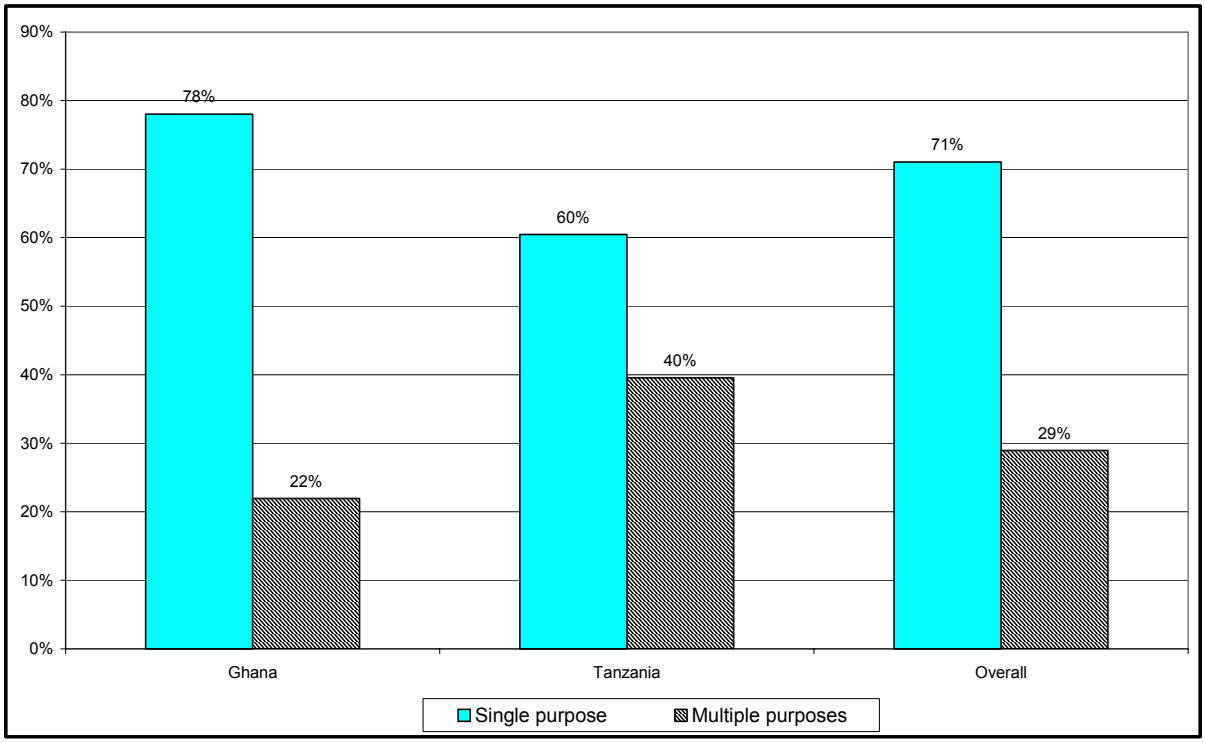



**Figure 3: Single vs. multi-purpose trip proportions**

### 3.3 Activity Patterns

In Ghana and Tanzania a number of interviews were carried out with individuals with the aim of establishing their daily activities throughout the year (rainy and dry seasons). The total numbers of interviews carried out in Ghana and Tanzania were 6 (3 men and 3 women) and 19 (10 men and 9 women) respectively. The interviewees were then divided into two broad groups – poor and non-poor. Means of livelihood was one of the indicators that was used in the identification of poor and non-poor respondents. As well as occupation, information from interviews and FGDs, such as the materials used to build houses and the clothing worn, was also used to identify suitable individuals to interview. In Tanzania, the self perception method was also used in the identification process.

Interviews were conducted by first asking people to list all the activities they were involved in and to discuss the time in the year that these activities took place. This led on to questions concerning the order and duration of these tasks in a typical day in the dry season. The answers were written down in long hand and the basic figures entered into an activity diary form. The results from these interviews provided the basis of analysis in this section.

The results of the activity diary provided some understanding of the activity patterns of different living standards and gender groups in rural Ghana and Tanzania. However, given that the sample size was small in both countries and the respondents' living standards were determined using subjective methods, the results need to be viewed cautiously. They may not be representative of the activity-time use patterns of the mentioned living standards and gender groups. These results should therefore only be used as a very rough guide, not as hard evidence. However, they aid in the understanding of the activity-time use patterns.

Table 15 and Table 16 present the average time spent by the respondents for different purposes disaggregated into gender and social groups in Ghana and Tanzania respectively. The following conclusions can be drawn from the figures presented Table 15 and Table 16:

- In Ghana, both men and women spent more time in an average day for work than any other any other activity. However, in Tanzania both men and women spent most time for sleep. An average woman spent more time in work than an average man in Ghana – an average man and an average woman in Ghana spent 7.3 hrs and 8.3 hrs respectively for work. Conversely, in Tanzania an average man spent more time in work than an average woman – 6.7 hrs for men against 2.7 hrs for women. An average woman in Ghana spent considerably less time for social and leisure and more time in domestic tasks than an average man. In Tanzania an average man spent considerably less time in social and leisure activities and domestic tasks than an average woman;

**Table 15: Average daily time allocation by the respondents in hours (Ghana)**

| | | Sleep | Social and Leisure | Sleep and Social and Leisure | Work | Domestic Work |
|---|---|---|---|---|---|---|
| Men | Non-Poor | 7.0 | 3.7 | 10.7 | 8.0 | 0.0 |
| | Poor | 7.7 | 5.2 | 12.9 | 5.8 | 1.1 |
| | Overall | 7.2 | 4.2 | 11.4 | 7.3 | 0.4 |
| Women | Non-Poor | 5.7 | 1.8 | 7.5 | 8.8 | 4.7 |
| | Poor | 6.3 | 1.6 | 8.0 | 7.3 | 6.7 |
| | Overall | 5.9 | 1.7 | 7.7 | 8.3 | 5.3 |
| Overall | Non-Poor | 6.4 | 2.8 | 9.1 | 8.4 | 2.3 |
| | Poor | 7.0 | 3.4 | 10.4 | 6.5 | 3.9 |

**Table 16: Average daily time allocation by the respondents in hours (Tanzania)**

| | | Sleep | Social and Leisure | Sleep and Social and Leisure | Work | Domestic Work |
|---|---|---|---|---|---|---|
| Men | Non-Poor | 8.4 | 3.9 | 12.3 | 7.1 | 0.0 |
| | Poor | 9.2 | 2.9 | 12.2 | 6.3 | 1.3 |
| | Overall | 8.8 | 3.4 | 12.2 | 6.7 | 0.7 |
| Women | Non-Poor | 8.9 | 5.3 | 14.2 | 3.3 | 3.1 |
| | Poor | 7.9 | 7.6 | 15.5 | 2.2 | 3.0 |
| | Overall | 8.4 | 6.5 | 14.9 | 2.7 | 3.0 |
| Overall | Non-Poor | 8.6 | 4.6 | 13.3 | 5.2 | 1.6 |
| | Poor | 8.6 | 5.3 | 13.8 | 4.2 | 2.2 |

- In Ghana and Tanzania an average non-poor person spent more time for work than an average poor person – 8.4 hrs and 6.5 hr for the non-poor and the poor respectively in Ghana and 5.2 hrs and 4.2 hrs for non-poor and the poor respectively in Tanzania. This is also the case for poor men and women. However, both in Ghana and Tanzania the non-poor spent less time for domestic tasks than the poor. Again this is also the case for poor men and women in Ghana and poor men in Tanzania. Only an average non-poor woman in Tanzania spent marginally higher time for domestic tasks than an average poor woman. An average poor person in both Ghana and Tanzania spent more time in social and leisure activities than his/her non-poor counterpart. This is also the case when the time for sleep and social and leisure activities are combined.

The conclusions from similar analysis in Bangladesh were different. The differences between the two studies are summarised in Table 17.

**Table 17: Comparisons of activity analysis results between the Bangladesh Study and the African Studies**

| Activity | Bangladesh study | African Studies |
|---|---|---|
| Sleep time | • The time for sleep for an average poor person is significantly higher than their non-poor counterpart. This is also true for an average poor man. However, the time for sleep for an average poor woman is found not to be significantly different from that of her non-poor counterpart | • The time for sleep for an average poor person is higher than a non-poor person in Ghana. This is also true for men and women in Ghana. However, an average poor person and an average non-poor person in Tanzania spent similar time sleeping. An average poor woman in Tanzania spent less time sleeping than her non-poor counterpart. |
| Social & leisure | • An average non-poor person spends a significantly higher time in social and leisure activities compared with an average poor person. This is true for an average non-poor man and an average non-poor woman | • An average poor person in both Ghana and Tanzania spent more time in social and leisure than their non-poor counterparts. This is also the case for men in Ghana and women in Tanzania. However, an average woman in Ghana spent slightly lower time for social and leisure activities than her non-poor counterpart. An average poor man in Tanzania spent less time in social and leisure than his Ghanaian counterpart. |
| Sleep plus social and leisure | • In the case of sleep, social and leisure combined there was no significant difference between an average poor and an average non-poor person. This was also true for both men and women | • In the case of sleep, social and leisure combined an average poor person spent more time than his/her non-poor counterpart. This is also true for poor men and women in Ghana and poor women in Tanzania. Only an average poor man in Tanzania spent marginally lower time for sleep, social and leisure than his non-poor counterpart. |
| Work & domestic work | • In the case of work and domestic tasks there were no significant differences between an average poor and an average non-poor person. This was also true for both men and women | • An average poor person in Ghana and Tanzania spent less time in domestic tasks and less time in work than his/her non-poor counterpart. This was also true for men and women in Ghana and men in Tanzania. However, an average woman in Tanzania spent marginally higher time in domestic activities than her non-poor counterpart. |

### 3.4 Summary of the Chapter

This chapter has dealt with three aspects. The first part has set out the approaches used to identify poor and non-poor travellers. A range of approaches was necessary to identify the appropriate threshold level of expenditure to distinguish between poor and non-poor roadside interviewees. The second part describes the results of the travel purpose surveys undertaken and the third part provides results on the survey of activity patterns of a sample of rural men and women.

# 4. TRAVEL TIME SAVING VALUES

This chapter presents the estimated travel time saving values in Ghana and Tanzania. The study used preference methods – both SP and RP – in the estimation of the WTP for the travel time saved. The chapter presents both base travel time saving values (in-vehicle and walking) and other personal and travel attribute values. The chapter is organised the following way: (i) first it presents the estimated base in-vehicle and walking time saving values for Ghana and Tanzania; (ii) then it presents the other travel and socio-economic attribute related values; (iii) next the suitability of the RP and SP approaches is discussed; and (iv) finally, the estimated values from African studies are compared with Bangladesh study values. The chapter also discusses the implications of the estimated rural travel time values on the guidance of the World Bank, provided in a Transport Note.

## 4.1 Estimated Base In-vehicle & Walking Time saving Values

Table 18 presents the estimated base and attribute travel time saving values for Ghana and Tanzania and the relevant model statistics. Appendix XII presents coefficients of the chosen models and their t-statistics. The results are based on the analysis of the SP questionnaires for both countries. RP data were found unsuitable for estimation of travel time saving values (see section 4.3 for more detailed discussion of the suitability of RP and SP approaches). Average base in-vehicle travel time saving value of Ghana is Cedi 1,627 (or US$0.18) per hour. Values for men and women are Cedi 1,731 and Cedi 1,523 respectively i.e. women's VoT is 88% of that of men's. Average walking time saving value in Ghana is Cedi 2,886 per hour, i.e. 77% higher than the average IVT value. In-vehicle and total travel time saving values for Tanzania could not be calculated separately due to correlation problems during data modelling. The base IVT saving value has been calculated at TZS 195 (or US$0.18) per hour under the assumption that the base walking time value is 50% higher than the IVT saving value (Table 18). As in Ghana, women's value of time is lower than men's in Tanzania. The base in-vehicle travel time saving values for men and women are estimated at TZS 213 and TZS177 per hour, i.e. women's travel time saving value is 83% of that for men.

The higher base walking time saving value is to be expected as walking attracts higher disutility compared to in-vehicle travel. This result is also supported by evidence from a group discussion in Ghana on preference of transport modes. Women were asked to carry out a pair-wise ranking of the various means of transport available in the village. The results are shown below:

| | **Walking** | **Bicycle** | **Motorbike** |
|---|---|---|---|
| **Walking** | | | |
| **Bicycle** | Bicycle | | |
| **Motorbike** | Motorbike | Motorbike | |
| **Mammy Wagon** | Mammy Wagon | Mammy Wagon | Mammy Wagon |

**Table 18: Estimated travel time saving values**

| | Ghana (Cedi/hr) | Tanzania (TZS/hr) |
|---|---|---|
| | **Combined SP** | **Combined SP** |
| **Base Values** | | |
| IVT (men) | 1,731 | 213 **[a]** |
| IVT (women) | 1,523 | 177 |
| IVT (average)[11] | 1,627 | 195 |
| Walk (male) | 2,991 | **[b]** |
| Walk (female) | 2,782 | **[b]** |
| Walk (average) | 2,886 | **[b]** |
| **Additional values** | | |
| Alternate Specific Constant (ASC) for Minibuses[12] | Cedi 939 | N/A |
| ASC for Mammy Wagons | Cedi 731 | N/A |
| Children (travellers below 16 years of age) | -345 Cedi/hr | -94 TZS/hr |
| Uncomfortable travelling condition | 1,388 Cedi/hr | 110 TZS/hr |
| Market day | Not an additional factor | Not an additional factor |
| Safe travelling condition | Not considered | Not an additional factor |
| Use of visual aid in SP | Not an additional factor | Not an additional factor |
| Travellers with a permanent job | 1,515 Cedi/hr | Not an additional factor |
| Social and leisure travel | Not an additional factor | Not an additional factor |
| Travellers with a load | Not an additional factor | Not an additional factor |
| Travellers with a watch | 259 Cedi/hr | 35 TZS/hr |
| Travellers who are traders | Not an additional factor | Not an additional factor |
| Poor traveller | -173 Cedi/hr | -84 TZS/hr |
| Travelling on poor road | Not an additional factor | 51 TZS/hr |
| Travelling on wet season | Not an additional factor | Not an additional factor |
| **Model statistics** | | |
| Rho_Sq | 0.074 | 0.097 |
| Rho_sq Const | 0.065 | 0.080 |
| Scale Factor SP1 | N/A | N/A |
| Scale Factor SP2 | 0.68 | Not significant |
| Scale Factor SP3 | 0.39 | 0.68 |
| Scale Factor SP4 | Not significant | Not significant |
| Scale Factor SP5 | 0.70 | 1.24 |
| Scale Factor SP6 | 0.45 | Not applicable |

Notes: **[a]** assumed that average WLKT saving value is 50% higher than average IVT saving value.
**[b]** WLKT and IVT values could not be estimated separately.

According to the discussants, the Mammy Wagon was the most popular means of transport, largely because it was more comfortable and faster than the other modes.

[11] Simple average of male and female
[12] Alternative Specific Constant, to capture subtle preference towards certain mode.

Walking was, unsurprisingly, unpopular, because it took longer and was painful and tiring. Bicycles and motorbikes were felt to be better than walking. Asked why bicycles and motorbikes are not as good as the Mammy Wagon, 'the sun will still beat you,' responded the women (women's group discussion, Chegu village, 08/03/04).

The result on lower travel time saving values for women is similar to the outcome in the Bangladesh study. Women in Africa are very active economically and are as likely as men to be involved in business. Results of the activity analysis in Section 3.3 showed that women spent less time in sleep and social and leisure activities than men in Ghana. On the other hand women spent more time in work and domestic work than men. Evidence from Ghana suggests that women make up roughly 85 percent of the wholesale and retail trading industries and about two-thirds of manufacturing, working mostly in the informal sector (World Bank, 1999). World Bank (1999) also reported that women usually grow food while men grow cash crops. Women work longer hours than men -15 to 25 per cent longer, when unpaid household work (e.g. child-rearing, cooking, collection of fuel-wood etc.) is accounted for (Lloyd and Brandon, 1993). Results of the travel purpose data analysis show that the proportions of trips made by women for wider socio-economic needs both in Ghana and Tanzania are similar to those by men. This clearly shows that women's time is as constrained as men's if not more. The question is then why women's WTP to save travel time is lower than men. The main reasons for women's lower VoT in Ghana and Tanzania may be the following:

**Box 1: Men's domination in financial decision making and women's carefulness with money**

To get a better understanding of the difference in willingness to pay between men and women, men and women in Kisange Sangeni and Umbwe villages were asked in separate groups about control of the purse strings in the households. In all groups it depended on what was being bought and the amount to be spent. In general both men and women made purchasing decisions on less expensive items such as food and clothing. However, for more expensive things such as house repairs and furniture, men always had the final say. In both men's groups it was agreed that men used to hold the purse strings completely but this was changing as more women do paid jobs and attitudes are changing. Women agreed with this view. The other general view was that women are more careful with money than men.

- Although women are involved as extensively as men in income earning activities, they earn less than men. National Bureau of Statistics (2002) confirms that women with the same educational qualifications earn considerably less than men in Tanzania. Women with a tertiary educational qualification earn only about 50% of their male colleagues. Therefore, the purchasing power of women is less than that of men.
- Women seems to be more careful about spending money as found in men's and women's group discussions in Tanzania (Box 1)
- Men are more dominant in financial decision making as found in the same group discussions.

### 4.2 Estimated Values for Other Travel and Socio-economic Attributes

The following paragraphs present the estimated values for other travel, socio-economic and other attributes. The study has statistically tested the travellers' personal and travel attributes that significantly influence the VoT. In the case of significant attributes the personal and travel attribute values calculated using the model coefficients. They included: (i) safe travelling conditions; (ii) travelling on a market days; (iii) uncomfortable travelling conditions; (iv) travellers who are below 16 years of age; (v) use of visual aid in the administration of the SP questionnaires; (v) travel for social and leisure purposes; (vi) travellers wearing a watch; (vii) travellers with a permanent job; (viii) travellers who are traders; (ix) travelling with a load; (x) travellers who are poor; (xi) poor road conditions; and (xii) travelling in wet season.

**Safe travelling conditions**

In a focus group and from individual interviews, safety was identified as an issue for minibus passengers in Tanzania. 'People who are in a hurry will often shout at the drivers [of the minibus] to go faster or not to stop at pick-up points' said a man from Marangu. He went on to say 'People seldom ask them to slow down. They feel they can't, but they often drive dangerously'. A question was incorporated in the SP and RP questionnaires to test whether safety considerations significantly influence travellers' WTP to save travel time. Respondents were asked about the safe time for travelling with a particular mode for the particular journey. Comparisons of the stated time with the values in the SP questionnaires helped to establish whether a particular journey was considered safe or unsafe by the respondents. However, it was found that rural travellers in Tanzania were unwilling to attach any additional values for safer travelling conditions. The insignificant result for safe travelling conditions was surprising given the concerns expressed in the focus group and often by individual travellers. It is difficult to interpret the reasons for such an insignificant difference between safe and unsafe travelling condition. The main reasons may include:

- the strong safety concerns expressed by one group may have been due to a particular incident in that area;
- The methodology for identifying safe and unsafe travelling conditions may not be accurate. During the preference surveys it was found that respondents often replied rather arbitrarily to the question concerning safe travelling time.

This finding seems to be in line with the findings by another study in Asia (Cook et al., 2004). Cook et al. (2004) found that road safety was not a high priority for the poor in Asia although they often were the main victims.

**Market days**

Day of travel (market vs. non-market day) is considered to be a factor that can influence the travel time saving values in developing countries. The Bangladesh study found that this was the case. However, for both Ghana and Tanzania no significant difference was found in the WTP for travelling on a market day versus travelling on a non-market day. The factors underlying this result may include one or more of the following: (i) **Lower ability to pay more even if they are constrained in**

**terms of time on a market day**: The majority of people, especially poor people, attend the market for a specific reason - generally to buy and sell produce. Many people, mainly the women, are involved in petty trading in rural markets. However, the amounts earned by the women are very small and do not justify paying the additional costs of transport (Box 2). (ii) **Close proximity of the markets:** The study areas were found to have many markets. People have a choice of markets within a reasonable distance of their homes. Such proximity might have reduced the time budget constraints. For example, two girls interviewed in Himo market in Tanzania opined that a faster mode of transport would not save them a great deal of time as their house was only 15 minutes away by minibus. (iii) **Social benefits of attending a market**: Market day travelling may not always be associated with disutility. Travel to markets attracts social benefits - rural people, especially rural women in Africa, use markets as a place to socialise.

**Box 2: Lower ability to pay**

'If we spent more money on transport our profits would go to the *Hiace* driver' was a woman market trader's response in Kiborloni market (Tanzania) to the option of faster travel to get to the market but at a greater price. Her day started at 6:30 when she and her daughter walked from Machango down to Kiborloni market just outside Moshi Town, a one hour walk. They then bought tomatoes and mangoes from a farmer who was in the market. They then went to a different part of the market to sell them for a slight profit.

'Both men and women go to market. Some women will go and sell things and then buy their things. If the men have something to sell they will give it to the women to sell for them. Men will go only to buy. Men will go on their bicycles but women will walk or join a lorry if they have the money, but usually they walk as the lorry is too expensive' *(Market trader, Jimli Market: Ghana)*.

## Non-essential trips

In both the countries, there was no significant difference between WTP to save time for essential (e.g. commuting, going to market to sell produce etc.) and non-essential (e.g. travelling for social and leisure reasons) travel purposes. These findings are similar to those from Bangladesh. The conventional wisdom in developed countries is that the VoT for non-essential trips should be lower than for essential trips. However, it is necessary to view social and leisure trips in rural areas of a developing country in a different way from those in developed countries. Rural people, especially the rural poor, in developing countries consider that social and leisure trips include more of an element of investment in social capital accumulation providing a significant return in terms of security and welfare than they do in developed countries.

## Travelling with a load

Travelling with a load[13] attracts additional disutility. It was found in Bangladesh that travelling with a load attracts additional travel time saving values. However, in Ghana and Tanzania, travelling with a load attracts no significant additional travel time saving values. The argument in support of the additional WTP for travelling with a load in Bangladesh was that it attracted additional disutility when carried on

[13] A traveller is considered to be travelling with a load if he/she carries a load over 5 kg.

passengers' lap to make extra space for fellow passengers or continuous vigilance to protect the loads from theft if they are placed close to the passengers.

Evidence suggests that the with-load travelling conditions in Ghana and Tanzania are different from Bangladesh. In general, in the study areas commercial vehicle passengers (minibuses, Mammy Wagons) travelling with a normal small load (a small bag of agricultural produce or household goods like clothes, groceries etc.) are not charged extra. Passengers with larger loads usually put them on the roof rack of the minibuses or strapped to the back of the vehicle. Given the cramped condition within the vehicles, especially in minibuses, travellers are not usually allowed to carry loads inside vehicles. Also it appears that the risk of goods being stolen from the vehicle is insignificant. Given these differences in the with load travelling conditions among Ghana and Tanzania and Bangladesh, the unwillingness to pay an additional amount seems justified in Ghana and Tanzania.

**Uncomfortable travelling conditions**

As in the Bangladesh study the WTP to avoid uncomfortable travelling conditions was tested. Travelling conditions were included as a variable in a questionnaire in Ghana and two questionnaires in Tanzania (Appendix IX). Visual aids were also used in administering the questionnaires with travelling conditions as a variable. Appendix XVII shows the types of photographs used in explaining the comfortable and uncomfortable travelling conditions. Uncomfortable travelling conditions attracted 85% and 56% additional values in Ghana and Tanzania respectively (Box 3). Similar was the finding from Bangladesh where WTP to avoid uncomfortable travelling conditions was 65% higher than the base IVT. Perhaps, the extreme weather conditions in northern Ghana may have contributed to the higher WTP in Ghana than in Tanzania.

**Box 3: Women's perception about comfort in Tanzania**

In a focus group in Umbwe village and in subsequent interviews the comfort factor was at the forefront of people's minds. Women in the focus group described how, at busy times of day, *Hiace* operators could cram as many as 30 people in. If the women had children with them they would often pass them to others who had more space. To reinforce the importance of comfort when the group were asked to describe their 'dream' *Hiace* ride the factors which came out top were a good interior (comfy seats, etc), a good speed and no crowding. All factors affecting comfort.

**Age of travellers**

As mentioned in Section 2.2.1, one of the shortcomings of the Bangladesh study was that it did not attempt to value children's travel time savings. Efforts were made to capture the children's value of time in this study. Respondents at or below the age of 16 were considered to be children. Before the preference surveys, FGDs were held with parents' and children's groups to find the best possible way to administer the preference questionnaires (see sections 2.2.1 and 2.2.2 for details). The focus group discussions confirmed that children did have a concept of money and would be able to answer the preference questionnaires by themselves. Therefore, the preference questionnaires were administered directly to the children in both Ghana and

Tanzania. The children's VoT was found to be lower than adults' – 21% and 48% less than the base IVT in Ghana and Tanzania respectively.

A number of factors help to explain the lower value that children place on their travel time savings. A child's ability to pay is less than that of an adult as the adults are generally in control of the family cash (Box 4). Children also, possibly, overestimate the value of money. A relatively small sum of money, to an adult, could be considered a significant amount to a child, especially a young child. Focus group discussions with school children in both countries confirm that children do not make mode choice decisions as they do not pay for transport themselves – for most children, the decision is made by the father, or occasionally the mother (Box 4).

**Box 4: Children's mode choice decision and willingness to pay**

In a group discussion in Ghana, the women were asked whether children have any influence over what means of transport they take. All the women agreed that children do not have the power to decide, irrespective of whether they are boys or girls, since they do not pay for transport themselves (women's group discussion, Chegu village, 08/03/04).

While discussing transport preference, one of the children in Ghana, 12 year-old Alhassan, said that he would prefer to use the Trotro than the Mammy Wagon because it is faster and you do not get dirty. However, when cost was brought into the equation he said he would take the Mammy Wagon because it is cheaper.

## Use of Visual Aid in the Preference Survey

The study tested whether the use of visual aids when administering the SP questionnaires had any influence on the VoT of the respondents. As mentioned before, the aim of visual aids was to facilitate easier explanation of the questionnaire to the respondents. Visual aids were used with 3 out of 5 types of questionnaires in Tanzania and 3 out of 6 questionnaires in Ghana. Pictorial cards similar to the one in Appendix X were used to aid decision making by respondents. The enumerators felt that use of the visual aid encouraged respondents to participate in the study and helped them understand the questions better. The analysis of responses, however, shows that the use of visual aids had not significantly influenced respondents' WTP to save travel time. It could be concluded that respondents had responded rationally with and without visual aids.

**Box 5: He can pay more for a faster journey and comfortable travel**

Iddrisu Fuseini is a teacher in the local school in Kulugini, although his home town is Tamale. The majority of his trips are to the school, for which he uses his bicycle. For trips to see his family in Tamale, where he will also do the majority of his shopping for provisions or visits to the bank, he would use any available means that pass the village, although he prefers the *trotro* or bus because it is more comfortable. For Iddrisu, comfort is more important than cost savings and he rarely travels by Mammy Wagon if there are other means available. In a Mammy Wagon, the fare is less than with the *trotro* or bus but the journey takes longer and you can sometimes arrive soiled or wet, especially if it is the rainy season.

## Travellers with a permanent job

Section 2.3.1 showed that the consumption expenditure of a household with a member in a permanent job was expected to be significantly higher than the household without one. Therefore, travellers belonging to households with

members in permanent jobs would be willing to pay more to avoid the inconvenience of longer travel as they have the ability to do so (Box 5). The Bangladesh study found that the WTP for non-farm wage earners (salaried persons or traders) was more than four times higher than the base IVT value. The Africa studies found that the WTP for travellers from households with members in permanent jobs in Ghana is approximately double (93% higher) the base IVT value. However, in Tanzania no significant difference was found between the WTP of travellers from households with members with and without permanent jobs. It is difficult to find an explanation for such an insignificant difference in Tanzania.

**Travellers with a watch**

Owning a watch, particularly in rural areas in developing countries, was uncommon only a few years ago. It used to be an indication of wealth and status. However, with the availability of cheap electronic watches, their ownership is wider. An electronic wrist watch in Tanzania costs only TZS 500 (about 50 US Cents). Watches are worn as a fashion item by the young and therefore, wearing of non-working watches is also common. The study collected data on the wearing of working and non-working watches by respondents. Table 19 shows that approximately every other respondents wore a watch in Tanzania and one out of eight of the watches was non-working. In Ghana the respective figures were one in every four respondents and one in every seven watches. The proportion of men wearing watches was higher than women in both countries.

The study tested the hypothesis that travellers with watches attach more value to travel time savings. Travellers with watches were found to have higher WTP to save travel time compared with travellers without watches – the WTP is 16% and 18% over the base value for Ghana and Tanzania respectively.

**Table 19: Respondents with watches**

| Country | | Proportion with watch | Proportion non-working watch |
|---|---|---|---|
| Ghana | Men | 34% | 12% |
| | Women | 12% | 24% |
| | Overall | 26% | 14% |
| Tanzania | Men | 48% | 13% |
| | Women | 40% | 11% |
| | Overall | 44% | 12% |

**Travellers with an established permanent business**

Section 3.1 shows that households in Ghana with at least one member engaged in permanent business has spent significantly more in consumption than households without such business. However, there was no significant difference between households with a member engaged in permanent business and without in Tanzania. In both the cases the VoT of the travellers with an established business is not significantly different from that for travellers without such businesses. One of the problems the study faced is identification of travellers from households with permanent businesses from the roadside interviews. They were identified subjectively

and it may well be the case that the enumerators could not differentiate permanent traders from petty or seasonal traders.

## Poor Travellers

The conventional wisdom is that VoT increases with the increase of household income – although not proportionately. However, the Bangladesh study found that this might not always be the case. In south-western Bangladesh it was found that the rural poor were willing to pay more to save travel time than non-poor travellers. A possible explanation for this counterintuitive result is that the poor in Bangladesh operate on a very tight time budget and are therefore willing to pay a premium for time saving. Further, since many of the poor in Bangladesh are either landless, seeking and getting to income earning opportunities involves some travel and any time savings would leave more time for earning.

**Box 6: Tales from a better off woman and a poor woman**

Fuseina Jobini is a 50-year-old woman who lives in Chegu, Yendi district of Ghana. She is a farmer as well as involved in shea butter processing and selling and is considered to be better off than many women. She travels to Tamale on market days to sell her shea butter. Fuseina uses Mammy Wagon for her market day travel to Tamale because that is the vehicle most readily available. She would prefer the *trotro* because it is more comfortable and better. If the charge on the goods is higher, she would calculate and see if it would be profitable. If so, she would pay and save time and travel in comfort.

Tompa Wombe is a 62 year-old widow who lost her husband 2 years ago. Tompa burns charcoal for a living but has no farmland so survives solely on this income. Unlike Fuseina Jobini, Tompa Wombe travels only a few times in a year. She travels to Jimli for social events and to Tijo occasionally to visit her uncle. She always walks to Jimli even if a vehicle is available to save a fare of ¢2,000 for that journey.

However, the poor in Ghana and Tanzania were found to have significantly less VoT than their non-poor counterparts – 11% and 43% less than the base IVT saving values for Ghana and Tanzania respectively (Table 18). Activity diary analysis results show that the poor in Ghana and Tanzania do not operate on as tight a time budget as the poor in Bangladesh. Poor in Ghana and Tanzania were found to spend more time in social and leisure activities than the non-poor (Section 3.3). Also the amount of land owned by the households of poor respondents in Ghana and Tanzania are considerably higher than in Bangladesh. The average amount of land owned by the households of the poor respondents in Ghana, Tanzania and Bangladesh were 5.82, 2.71 and 1.55 acres respectively (Table 20). Table 20 also shows that the proportion of landless and functionally landless households of respondents in Bangladesh was far higher than in Ghana and Tanzania.

**Table 20: Average landowning characteristics of the poor respondents' households**

| | Bangladesh | Ghana | Tanzania |
|---|---|---|---|
| Amount of land own (acres) | 1.55 | 5.82 | 2.71 |
| Proportion of landless households (%) | 26% | 12% | <1% |
| Proportion of functionally landless households (%) **[a]** | 40% | 12% | <1% |

Note: **[a]** less than 0.5 acres of land

**Poor road condition**

The study also tested for the influence of poor infrastructure on the VoT. The hypothesis is that the WTP to save travel time on a poor road due to the additional discomfort will be higher. Two roads (one in Ghana and one in Tanzania) were identified as poor roads (based on subjective observation of physical condition) out of the six roads along which the preference questionnaires were administered. These roads were: Jimli-Chegu in Ghana and Uchira – Kisange Sangeni in Tanzania. In Ghana there was no significant difference in the WTP between the poor road and non-poor roads (Table 18). This is consistent with the result from the Bangladesh study. However, in Tanzania travelling on a poor road attracted higher VoT than on non-poor roads – equivalent to 26% of the average base value (Table 18). The higher premium respondents are willing to pay to save travel time on poor roads in Tanzania may be due to the extremely poor conditions of the road (Uchira – Kisange Sangeni) compared with the chosen poor road in Ghana (see Appendix V for the description of the study roads and their conditions).

**Travelling in the wet season**

The study also tested whether there exist any seasonal variations in the VoT. The seasons appear to have no bearing on the respondent's WTP to save travel time (Table 18). The Bangladesh study found a similar result. It is difficult to find clear explanations for these results. One plausible explanation is that the busy farming times cut across both seasons. For example, in the Ghana study area (Yendi District) land preparations begin in the dry season, planting and weeding of major crops (e.g. maize, groundnuts) take place during the wet season (April to July) and harvesting and transporting continue into the next dry season. In Tanzania the wet season data were collected in December 2004. December is considered to be a rainy season month but there was hardly any rain during when the studies were being undertaken.

### 4.3 Suitability of RP and SP Methods

One of the major findings of the Bangladesh study was that the RP approach was unsuitable for valuing rural travel time savings in Bangladesh. The limitations of the RP approach in the context of Bangladesh were:

- There do not exist realistic trade-offs between different modes or within-mode in rural areas. The RP approach is only suitable where realistic trade-offs exist.
- It was difficult to capture RP data due to complicated trip characteristics of rural travellers. In many cases it involved the use of several modes, including walking
- Establishing the IVT, let alone the IVT for competing modes was difficult because of poor time awareness of the majority of rural travellers.
- Establishment of waiting time (WT) was even more difficult as commercial transport services do not operate to schedule but wait until the vehicle is full.
- RP data collection was time consuming and expensive.

The RP approach was also tested in both Ghana and Tanzania. A total of 775 RP questionnaires were administered in this study – 405 in Ghana and 370 in Tanzania. Attempts have been made to arrange and model the data. In Tanzania the data could not be arranged in proper format for modelling. Although the Ghana data were modelled, most of the coefficient values were insignificant and/or had improper signs (for example, cost coefficients were found to be insignificant and had positive signs. Appendix XIII presents the model statistics of some of the models.

All the limitations of the RP approach in Bangladesh seem to be valid in Ghana and Tanzania. Worse still, the trade-offs between different modes and within mode are even more limited in the two countries. In rural Bangladesh for journeys of up to 10 km, there exists a trade-off between motorised and non-motorised modes. However, in the African study areas, alternative modes are virtually non-existent. Appendix XIV provides the main reasons for the unsuitability of RP approach in each of the study road corridor.

## 4.4 Comparisons of Travel Time Saving Values

### 4.4.1 Inter-country comparison of travel time saving values

Table 21 compares travel time saving values in the three countries – Bangladesh, Ghana and Tanzania. They are presented as a proportion of wage rates in the study areas at the time of the study. IT Transport (2002) sets out the procedures for calculating the wage rate in Bangladesh. Because of lack of credible secondary data, wage rate figures for Ghana and Tanzania were calculated using the wage related information collected from the study areas during the surveys (see Appendix XV for details). The main points emerging from the comparison are as follows:

- The average IVT figures range from 49% (Tanzania) to 64% (Ghana) of the average wage rate, with the average IVT figures for male travelers ranging between 53% (Tanzania) to 70% (Bangladesh). More detailed examination of evidence on local conditions, including the relative scarcity of transport services, would be needed to explain the differences. The range of IVT figures for females is considerably high, ranging from 33% (Bangladesh) to 60% (Ghana). Possible explanations for high VoT figures for females in Ghana and Tanzania compared to Bangladesh are discussed in Section 4.1. The most plausible reason is that women in Africa are more involved in wider socio-economic activities and are possibly more financially independent than their Bangladeshi counterparts;
- Average walking time saving values for Bangladesh and Ghana were 76% and 117% respectively of the average wage rate. Walking time saving values for Tanzania could not be estimated separately due to modeling problems. The average walking time value in Ghana is substantially higher than the walking time value in Bangladesh possibly because of the more extreme weather conditions in the Northern Region of Ghana, which increase the disutility of walking.

**Table 21: Inter-country comparisons of travel time savings (% of average hourly income)**

| | Bangladesh | Ghana | Tanzania[a] |
|---|---|---|---|
| IVT (male) | 70% | 68% | 53% |
| IVT (female) | 33% | 60% | 44% |
| IVT (average) | 51% | 64% | 49% |
| Walk (male) | 76% | 117% | N/A |
| Walk (female) | 39% | 109% | N/A |
| Walk (average) | 57% | 113% | N/A |

Notes: **[a]** walking and IVT saving values could not be estimated separately. Average WLKT saving values are assumed to be 50% higher than the average IVT saving values.
**N/A** – Not applicable

### 4.4.2 Inter-country comparison of travel and personal attribute values as a proportion of IVT values

Table 22 presents inter-country comparison of walking time and other travel and personal attribute values as a proportion of base IVT value:

- The average walking time (WLKT) figures for Bangladesh and Ghana are 112% and 177% of the base IVT respectively. This provides an average figure of 145% of the base IVT. This average figure is less than the figure in developed countries where it is often valued at double the IVT. Such a difference can, perhaps, be explained by the fact that rural people in developing countries are more accustomed to walking.
- Women's VoT figure as a proportion of the base IVT figure is considerably lower in Bangladesh (64%) compared to Ghana (94%) and Tanzania (91%). The average figure from three countries is 83%. Section 4.1 and IT Transport (2002) provide possible reasons.
- Children's travel time saving values in Ghana and Tanzania were estimated at 79% and 52% respectively of the adult's average base IVT values. This provides an average of 66%, about two third of adult's base value. The Bangladesh study did not value children's travel time savings.
- Market day travel and travelling with a load attracted additional 42% and 14% respectively of the base IVT value in Bangladesh. However, they were found not to be additional factors in the estimation of WTP to save travel time in Ghana and Tanzania. Although travelling on a poor road attracted an additional travel time saving value in Tanzania (26%), it was found be an insignificant factor in Bangladesh and Ghana.
- One of the major findings from the Bangladesh study was that the VoT of the poor was higher than that of the non-poor. IT Transport (2002) details possible reasons for the counter-intuitive finding. However, the travel time saving values for the poor in Ghana and Tanzania were lower than those for the non-poor, 89% and 57% of the base values respectively. Section 4.2 provides possible reasons for the difference in the findings between Bangladesh and these two countries based on differences in economic, land ownership and

other characteristics of the poor in Bangladesh compared with the poor in Ghana and Tanzania.

**Table 22: Inter-country comparison of travel time savings (% of base IVT)**

| | Bangladesh | Ghana | Tanzania |
|---|---|---|---|
| Average Walking time | 112% | 177% | *** |
| Women's time | 64% | 94% | 91% |
| Children's time | Not estimated | 79% | 52% |
| Uncomfortable travelling condition | 165% | 185% | 156% |
| Market day | 142% | N/A | N/A |
| Travellers with a permanent job | 521% | 193% | N/A |
| Travellers with a load | 114% | N/A | N/A |
| Travellers who are poor | 109% | 89% | 57% |
| Travelling on a poor road | N/A | N/A | 126% |

Notes: ******* could not be calculated separately; **N/A** - Not Applicable

### 4.4.3 Estimated travel time values and World Bank guidance

Gwilliam (1997) provided guidance concerning the time saving values to be used in the economic evaluation of World Bank transport projects. The guidance provides the travel time values (as proportions of household income) to be used where it is not possible to derive values locally, The following per hour time values are recommended: (i) work trip - 133% of the wage rate per hour; (ii) commuting and other non-working time values for adults and children - 30% and 15% respectively of household income per hour; (iii) walking and waiting time values – 50% higher than the value of the particular trip type.

The rest of this section compares the travel time saving values estimated in the Bangladesh and Africa studies with the World Bank guidance. Given that the African studies could not estimate the walking and IVT saving values from Tanzania separately, Tanzania results are excluded from the subsequent discussions. In the absence of other data, household "income" in Table 23 represented by the consumption expenditure, both cash plus kind, of the households estimated from the household surveys undertaken during the studies. Arguably, expenditure is preferred over income as an indicator of the economic situation of a household because it has been found to be more stable than income in a developing country rural context (Khan and Sen, 2001).

Table 23 shows that in Bangladesh and Ghana the non-working time savings values are 21% and 52% of the household income. This gives an average of 36.5%. This value of 36.5% is not considerably different from the value proposed by the World Bank – 33%. Therefore, it seems that the guidance concerning the non-working time saving values as a proportion of household income is reasonably valid. However, in a developing country rural context the household income should be represented by consumption expenditure. Children's time saving values were estimated at 41% of the household income in the case of Ghana. This means that the ratio of children and adult's VoT is 0.79. The ratio proposed by World Bank's guidance is 0.5. Therefore, the guidance provides lower children's travel time saving values. Given that children

play important productive and reproductive roles in rural areas of developing world, there is a need to adjust their time values upward. Gwilliam (1997) proposed a premium of 50% for walking and waiting time saving values over IVT values. Respondents in Bangladesh and Ghana valued walking time saving values at 12% and 77% over the IVT values; this gives an average of 44.5%. The Bangladesh and African Studies did not value WT saving values. If the WT saving values are considered at par with the walking time saving values then it appears that the guidance concerning the value of walking time is in line with the findings from rural Bangladesh and Ghana.

**Table 23: Time saving values as a proportion of household "income"**

| | **Bangladesh** | **Ghana** | **Tanzania** |
|---|---|---|---|
| Household income/yr **[a]** | 48,794 Taka | 9,113,442 Cedi | 694,557 TZS **[b]** |
| Household income/hr | 16.71 Taka | 3,121 Cedi | 238 TZS **[b]** |
| Household size | 6.01 | 11.1 | 6.19 |
| Non-working time saving values/hr | 3.50 Taka | 1,627 Cedi | 213 TZS **[c]** |
| Walking time saving values/hr | 3.91 Taka | 2,886 Cedi | n/a |
| Children's NWT saving values | n/a | 1282 Cedi | 118 TZS |
| NWT as a proportion of household income | 21% | 52% | 82% |
| Walking as a proportion of household income | 23% | 85% | n/a |
| Children's time as a proportion of household income | n/a | 41% | 42% |

Notes: **[a]** consumption expenditure (cash plus kind)

**[b]** National Bureau of Statistics Tanzania quoted a 28-day 2000/01 per capita figure of 8,538 for rural areas. This is equivalent to 689,785 per household (with an average household size of 6.2 for the respondents)

**[c]** IVT and WLKT saving values could not be estimated separately. Calculated under the assumption that the base walking saving time value is 50% higher than the base IVT saving value.

### 4.4.4 Adjustments to reflect resource values

The IVT, walking and other attribute values discussed above are financial values. IT Transport (2002) sets out the case for making adjustments to the financial working and non-working travel time values to reflect economic values and resource costs for their inclusion in economic appraisal. In summary, such adjustments are required to correct market distortions caused by unemployment, underemployment, taxes and subsidies. The working and non-working time saving values are adjusted using a shadow wage rate (SWR) factor and a Standard Conversion Factor (SCF) respectively. The SWR factors and the SCFs estimated for Ghana and Tanzania are shown below (Appendix XVI provides details of the necessary calculations).

| | Ghana | Tanzania |
|---|---|---|
| SWR factor | 0.80 | 0.86 |
| SCF | 0.96 | 0.86 |

Using the adjustments for non-working time saving values, their resource values become Cedi 1,562 per hour for Ghana and TZS 167 per hour for Tanzania.

### 4.5 Summary of the Chapter

This chapter has presented the results of the analysis of data gathered from the SP surveys. The results include average base in-vehicles time saving values for men and women followed by supplementary adjustments for different travel conditions (e.g. walking time and uncomfortable travel conditions) and socio-economic attributes (such as whether the traveller is a child and the socio-economic status of the traveller).

# 5. CONCLUSIONS AND RECOMMENDATIONS

The Africa VoT studies reported in this paper and the earlier Bangladesh study are based on the premises that (a) excluding traveller's travel time savings when appraising rural transport projects leads to a bias against rural and pro-poor infrastructure investments in developing countries, and (b) that approaches used in valuing time in developed countries can be adapted for use in the rural context in developing countries. The value of rural travel time savings per unit of time may not be large in developing countries but the total time saving benefits for all users from modal shifts and faster travel may be very substantial in relation to the relatively modest rural infrastructure investment costs.

The Bangladesh study demonstrated that: (a) it was right to take the value of rural travel time savings seriously in a developing country, (b) it was feasible to apply the theoretical model underlying VoT and the stated preference approach with some adaptations (notably the use of qualitative investigations and household and trip purpose surveys to gain an understanding of the local context and widen the concept of work-related activities.)

However, questions remained about the suitability of the approach in other developing countries with different terrain, socio-economic and transport conditions. Many African countries are characterised by low population densities, widely dispersed communities and less diverse and competitive transport services than Bangladesh. To test the suitability of the approach and the robustness of the results obtained in Bangladesh, IT Transport (with financial support from DFID) conducted studies in two African countries, Ghana and Tanzania, in locations with very different characteristics.

The African studies were carried out in Yendi District, Northern Region in Ghana and Moshi Rural District, Kilimanjaro Region in Tanzania. Qualitative research was essential for the design of the questionnaires and their fine-tuning, and in understanding some of the intricate mode choice issues. Household, preference (both SP and RP) and travel purpose data were collected through carefully designed questionnaires.

Chapter 2 presented the socio-economic and transport contexts of the study areas and detailed the methodology used in the study. Chapter 3 presented the results of the analysis relating to the identification of respondents' living standards, travel purpose and activity patterns. Chapter 4 presented and discussed the estimated travel time values for the two study areas and made some inter-country comparisons of travel time saving values and assessed the appropriateness of World Bank guidance on time values.

This chapter summarises the conclusions of the study based on discussions in earlier chapters. It also makes recommendations on the range of approaches for estimating travel time savings based on the studies.

## 5.1 Key Findings

- The average base in-vehicle travel time saving values were estimated at Cedi 1,627/hr (US$ 0.18) and TZS 195/hr (US$ 0.18) and were 64% and 49% of the hourly wage rates for Ghana and Tanzania respectively. Including the Bangladesh figure of 51%, the unweighted average for the three countries is approximately 55% of the wage rate and is close to the World Bank Guideline of 50%.
- The average walking time (WLKT) value in Ghana was 177% of the base in-vehicle time (IVT) value[14]. This figure is considerably higher than the Bangladesh figure of 112%.
- Women's VoT was found to be lower than men's (88% of men's value in Ghana and 83% in Tanzania). Women's VoT in Bangladesh was only 51% of men's VoT.
- The travel time saving value of school-age children was found to be lower than of adults (79% of the adult value in Ghana and 52% in Tanzania). The two country average is 66% of the average VoT for adults. The Bangladesh study did not value children's travel time.
- Other personal and travel factors that influenced the value of time savings in Ghana and Tanzania were:
  - uncomfortable travel conditions (attracting 85% additional value in Ghana and 56% in Tanzania);
  - travellers with a permanent job (93% additional value in Ghana);
  - travellers with a watch (16% and 18% additional value in Ghana and Tanzania respectively);
  - poor travellers' travel time saving values were lower than non-poor travellers – 11% lower in Ghana and 43% lower in Tanzania, whereas the willingness to pay among poor Bangladeshis to save travel time was 9% higher than of the non-poor; and
  - travelling on a poor road in Tanzania attracted an additional 26% value but was not an additional factor in Ghana.
- Factors found to have no significance were:
  - travel time saving values between essential and non-essential travel;
  - travelling with a load;
  - travelling on an improved road compared to a non-improved road (Ghana);
  - safe travelling conditions (Tanzania);
  - travelling on a market day (Ghana and Tanzania);
  - travellers who are traders; and
  - season during which travel is undertaken.

[14] The walking time value figure for Tanzania could not be estimated due to modelling problems.

### Summary of rural travel time savings

The study produced a set of rural travel time saving values for the study areas in Ghana and Tanzania as shown in the following tables:

| | Ghana (2004) | | Tanzania (2004) [a] | | Bangladesh (2001) | |
|---|---|---|---|---|---|---|
| | **Cedi/hr** | **US$/hr** | **TZS/hr** | **US$/hr** | **Taka/hr** | **US$/hr** |
| **Base values** | | | | | | |
| IVT (men) | 1731 | 0.19 | 213 | 0.20 | 4.75 | 0.08 |
| IVT (women) | 1523 | 0.17 | 177 | 0.17 | 2.25 | 0.04 |
| IVT (average) | 1627 | 0.18 | 195 | 0.18 | 3.50 | 0.06 |
| WLKT (men) | 2991 | 0.33 | 319 | 0.30 | 5.16 | 0.09 |
| WLKT (women) | 2782 | 0.31 | 265 | 0.25 | 2.66 | 0.05 |
| WLKT (average) | 2886 | 0.32 | 292 | 0.28 | 3.91 | 0.07 |

Note: **[a]** In-vehicle time (IVT) and walking time (WLKT) values could not be estimated separately. Calculated under the assumption that the WLKT value is 50% higher than the IVT time value.

| | Ghana (2004) | | Tanzania (2004) | | Bangladesh (2001) | |
|---|---|---|---|---|---|---|
| | **Cedi/hr** | **US$/hr** | **TZS/hr** | **US$/hr** | **Taka/hr** | **US$/hr** |
| **Additional computed values (selected variables)** | | | | | | |
| Children | -345 | -0.04 | -94 | -0.09 | NT | NT |
| Uncomfortable travel | 1,388 | 0.15 | 110 | 0.10 | 2.29 | 0.04 |
| Market day | NS | NS | NS | NS | 1.47 | 0.03 |
| Permanent job | 1,515 | 0.17 | NS | NS | 14.72 | 0.26 |
| With a load | NS | NS | NS | NS | 0.48 | 0.01 |
| With a watch | 259 | 0.03 | 35 | 0.03 | NT | NT |
| Poor traveller | -173 | -0.02 | -84 | -0.08 | 0.31 | 0.01 |
| Poor road | NS | NS | 51 | 0.05 | NS | NS |

Notes: **NS** - Not significant, **NT** – Not tested

## 5.2. Conclusions

- **Need for complementary qualitative studies**

  The study benefited from the extensive qualitative inputs, which not only helped in the understanding of the intricate mode choice and travel time valuation issues in the rural context of the developing countries but also helped in questionnaire design, especially the preference questionnaire design, and in the administration of questionnaires.

- **Need for complementary living standards surveys**

  As in Bangladesh, the econometric techniques used in Ghana were found to be suitable in identifying indicators of living standards and in estimating their coefficient values to estimate levels of household consumption. However, a simpler self perception method whereby households' assess their own food

security was successfully used in Tanzania to differentiate poor and non-poor respondents. Such methods may be used where resource limitations restrict the use of more rigorous methods or where modelling of the relationship between socio-economic indicators and living standards is difficult. Ideally validation by using both the methods for a sample should be used to increase confidence in whichever method is used.

- **Need to understand trip purpose**

  The practice in developed countries of dividing travel time savings into working and non-working time savings is valid in the developing country context. However, there is a need to redefine working trips to take account of rural livelihood patterns. The redefined working trips should include trips which have opportunity costs of lost time equal to the marginal value of income of the travellers. The redefined working trips may include: trips made in the course of work for another employer, trips made in the course of work as self employed, and trips made to sell or to purchase goods for profit. The main conclusions from the trip purpose analysis are:

  i. Combining the evidence from Ghana and Tanzania, over four out of ten trips were made for households' wider socio-economic needs; although the proportion of trips made for wider socio-economic needs is higher in Tanzania (62%) than Ghana (30%). The differences between proportions of trips made by men and women for different purposes were not large;

  ii. Less than 1% of trips in Ghana and 5.6% of trips in Tanzania were working trips using the conventional definition of 'working trips' from developed countries. However, the proportion becomes 1% (Ghana) and 11.5% (Tanzania) when the definition of work trips is expanded to include those made during the course of self-employment. Further, when trips made for the purpose of selling and buying goods for profit are added, the proportions become 13.6% (Ghana) and 18.5% (Tanzania). The average figure of 15.5% is lower than the comparable Bangladesh study figure of 21%.There is clearly a need to redefine work related trips and the time saving values of these trips should be equal to at least the relevant wage rates; and

  iii. The average figure for the two countries shows that 29% of trips had multiple purposes. The figures for the Ghana and Tanzania study areas were 22% and 40% respectively. These figures are higher than the Bangladesh figure of 14%. Given that the trip patterns of rural people in Africa are different (less frequent and longer trips) from those in Bangladesh (more frequent and shorter trips) the finding seems valid.

- **Suitability of stated preference and revealed preference methods**

  Theoretically the RP approach is considered to be the better approach as it explains actual choice behaviour. However, as in Bangladesh, this approach was found to be unsatisfactory because of the following limitations:

  - choice of available modes of transport and choices within a mode are limited;
  - alternative travel scenarios, in many cases, are complicated and may involve use of several modes, including walking;
  - poor time keeping awareness of rural travellers makes calculation of in-vehicle time difficult;
  - commercial vehicles do not operate to schedule and wait until the vehicle is full making calculation of waiting time difficult; and
  - RP data collection is lengthy and expensive.

  Empirical evidence from the two African countries and from Bangladesh shows that SP is the most suitable approach for valuing rural non-working travel time savings. However, the approach requires complicated experimental designs and unusual modelling techniques, which may get more complicated if choice responses from different SP experiments need to be reconciled.

- **Appropriateness of World Bank Guidelines**

  The World Bank guidance concerning non-working time saving values as a proportion of household income and the ratio of in-vehicle and walking and waiting time saving values are broadly comparable with evidence from the Bangladesh, Ghana and Tanzania studies. However, according to the empirical studies, the World Bank guidance concerning children's VoT needs upward adjustment.

  As mentioned above there is also a need to redefine work trips in the rural context of developing countries given the limited amount of formal employment.

- **Conversion of financial travel time savings values to resource values**

  There is a need to convert financial travel time saving values into resource values where world price numeraire is used in an economic analysis. The working and non-working time saving values need adjustments using the Shadow Wage Rate (SWR) factor and Standard Conversion Factor (SCF) respectively. The SWR factor and SCF calculated for the two study countries were:

| | Ghana | Tanzania |
|---|---|---|
| SWR factor | 0.80 | 0.86 |
| SCF | 0.96 | 0.86 |

When the adjustments are applied, the non-working time saving values for Ghana and Tanzania become Cedi 1,562 (US$ 0.17) per hour and TZS 167 (US$ 0.16) per hour respectively.

### 5.3 Applicability of Conclusions from the Bangladesh Study to the African Study

The main conclusions from the Bangladesh VoT study are valid in the context of the two study countries in Africa. The main similarities of the conclusions between Bangladesh and African studies are as follows.

- In both studies a combination of qualitative and quantitative approaches was found effective. The African studies further elaborated the use of qualitative methods which helped in the design and administration of the preference questionnaire.
- Econometric techniques were found suitable in both studies to explain household consumption levels. Both studies collected livelihood data at the same time as road-side preference surveys to estimate respondents' household expenditure levels. The Bangladesh study used the international poverty thresholds in the identification of poor and non-poor respondents and that coincided with domestic figures for poverty. However, in Ghana the international poverty line was found to be considerably lower than the figure used to categorise extreme poverty by the Government of Ghana, so the study used a local poverty threshold figure to identify poor and non-poor respondents. The international poverty threshold figure was unsuitable for use in Tanzania and there is no national poverty figure either. The study therefore used a self-perception method in the identification of poor and non-poor.
- As in Bangladesh, the SP approach was found to be suitable for valuing rural travel time savings in the two African studies. Although the Bangladesh study did not value children's travel time savings, children's VoT was successfully estimated in the two African countries;
- As in Bangladesh, the RP approach was again found unsuitable in the valuation of rural travel time savings in the African countries. The main limitation seems to be the absence of creditable alternative mode options. Although in Bangladesh some trade-offs (mainly between motorised and non-motorised modes) do exist for some distances (10-20 km), this is found not to be the case in the two African countries.
- Need for conversion of monetary values to resource values was applicable in the African context as in Bangladesh.

### 5.4 Recommendations for Appraisal Methodology and Policy

Based on the results of the Bangladesh and Africa studies, this section provides a range of approaches that can be used to estimate rural road users' value of time in developing countries.

**WORKING TRIPS**

| Ideal approach | Second best approach | Minimum approach |
|---|---|---|
| • **Conventional work trips**: Average observed formal employment wage rate (adjusted by shadow SWR and overheads factors) | • **Conventional work trips**: 1.33 x adjusted average observed formal employment wage rate (adjusted by SWR factor) | • **Conventional work trips**: Average wage rate of the skilled labour (adjusted by SWR factor). Applicable only if the proportion of conventional work trips is thought to be marginal. |
| • **Other trips that have opportunity costs of lost time equal to marginal value of income:** Observed weighted average wage rate (adjusted by SWR factor) | • **Other trips that have opportunity costs of lost time equal to marginal value of income:** observed weighted average wage rate (adjusted by SWR factor) | • **Other trips that have opportunity costs of lost time equal to marginal value of income:** observed weighted average wage rate (adjusted by SWR factor) |

**NON-WORKING TRIPS**

| Ideal approach | Pragmatic approach 1 | Pragmatic approach 2 |
|---|---|---|
| • Empirically derived travel time saving values for non-working time using preference approaches (using SP method) disaggregated by social, gender and age groups, modes, journey conditions etc. Also values derived for walking and waiting time. These values need to be adjusted by SCF. | • **Adult's IVT value (currency/hr)**: 0.55 x weighted average wage rate per hour (adjusted by SCF)<br>• **Children's IVT value (currency/hr)**: 0.79x0.55x weighted average wage rate per hour (adjusted by SCF)<br>• **Walking and waiting time value (currency/hr)**: 1.45x0.55 x weighted average wage rate per hour (adjusted by SCF) | • **Adult's IVT value (currency/hr)**: 0.37 x household consumption expenditure per hour (adjusted by SCF)<br>• **Children's IVT value (currency/hr)**: 0.79x0.37 x household consumption expenditure per hour (adjusted by SCF)<br>• **Walking and waiting time value (currency /hr)**: 1.45x0.37xhousehold consumption expenditure per hour (adjusted by SCF) |

Notes: **SWR factor:** The estimated SWR factors for Bangladesh, Ghana and Tanzania were: 0.75, 0.80 and 0.86. In the case when such a factor can not be calculated a value of 0.80 is suggested.

**SCF:** The SCFs for Bangladesh, Ghana and Tanzania were: 0.88, 0.96 and 0.86. In the case when such a factor can not be calculated a value of 0.90 is suggested.

**Consumption expenditure:** should include expenditure in cash and in kind.

The ideal approaches in the above tables assume that detailed studies specific to the country can be carried out. For valuing working time savings, the main data required are formal and informal wage rates. Additional data are required for calculating SWR factors. The ideal approach for estimating the value of non-working time savings is to conduct empirical studies, typically using the SP approach. The pragmatic approaches for estimating non-working time savings are based on empirical findings from the Bangladesh and Africa studies. They should be used if time and financial resources do not allow context specific studies.

Empirical results from rural Bangladesh, Ghana and Tanzania provide evidence to support the case for **routine inclusion** of value of travel time savings as users' benefits in the appraisal of rural transport infrastructure and service improvement projects in developing countries.

Although a unique non-working travel time saving value is justified from an equity point of view, in cases where the WTP of poor travellers to save travel time is higher than their non-poor counterparts (e.g. in rural Bangladesh), a differentiation between travel time saving values for poor and non-poor travellers is justified to favour pro-poor infrastructure investments.

The broad methodological approach to value rural travel time savings in developing countries may also be extended beyond the transport sector to other sectors (e.g. health and water sectors). However, there is a need to conduct further empirical studies to test the applicability of the approach under different circumstances.

## BIBLIOGRAPHY & REFERENCES


Ahmed, F., and Vaidya, K., 2004. "The Valuation of Travel Time Savings in Least Developed Countries: Theoretical and Empirical Challenges and Results from a Field Study." *Proceedings for the 10th World Conference on Transport Research,* Istanbul, Turkey, July 4-8, 2004

Ahmed, F., 1997. "Rural Transport Planning in Bangladesh: Gender and Social Class Bias." *Journal of the Second Conference of the East Asia Society for Transportation Studies (EASTS),* Vol 2 No.5

Booz-Allen & Hamilton Ltd., 2000. *PEM Benefit Parameter Project : Development of Research Approaches (Draft),* Booz-Allen & Hamilton, n.p.

Braden and Kolstad (eds), 1991. *Measuring the demand for environmental quality* Amsterdam: North-Holland.

Bristow, A. L., & Nellthorp, J., 2000. 'Transport Project Appraisal in the European Union, *Transport Policy*, 7(1), pp. 51-60.

Cook, C. C., Duncan, T., Jitsuchon, S., Sharma, A. K., and Guobao, W., 2004, *Assessing the Impact of Transport and Energy Infrastructure on Poverty Reduction (Final Report): RETA 5947*, Asian Development Bank, Manila.

Dawson, J., and Barwell, I., 1993. *Roads are not Enough: New Perspectives on Rural Transport Planning in Developing Countries*. Intermediate Technology Publication, London.

Department of Transport, 1995. *Draft COBA 9 Manual*, Highways Economics and Traffic Appraisal Division, London

Ghana Statistical Service, 2002. *2000 Population and Housing Census: Summary Report of Final Results*, Ghana Statistical Service, Accra

Government of Ghana, 2003. *Ghana Poverty Reduction Strategy 2003-05: An Agenda for Growth and Prosperity*, Government of Ghana, Accra

Gwilliam, K. M., 1997. *The Value of Time in Economic Evaluation of Transport Project (Infrastructure Notes No. OT-5),* The World Bank, Washington DC

Hague Consulting Group (HCG) and Accent, 1996. *The Value of Time on UK Roads – 1994 Prepared for Department of Transport*

Hasan, M. E., and Iglebaek, M., 2004. *Microfinance with Un-reached People in the Rural Area: Experience and Learning*, Paper Presented in Asia Pacific Region Microcredit Summit Meeting of Councils, 18 February 2004, Dhaka [also available

online at:
http://www.safesave.org/Hasan%20Emrul%20workingpaperextremepoorandMF.pdf]

Hayashi, Y., & Morisugi, H., 2000. 'International Comparison of Background Concept and Methodology of Transportation Project Appraisal', *Transport Policy*, 7(1), pp. 73-88.

Hine, J., Pangihutan, H., & Rudjito, D., 1998. *A Study of the Value of Time in Indonesia Using Stated Preference Data*, Road Research Development Project, IRE, Bandung

Institute for Transport Studies, 2003. *Toolkit for the Economic Evaluation of World Bank Transport Projects: Final Report*, Institute for Transport Studies, Leeds. [also available online at: http://www.transport-links.org/wb-toolkit/]

IT Transport, 2002. *The Value of Time in Least Developed Countries: Final Report*, IT Transport Ltd., Ardington [also available online at:
http://www.infrastructureconnect.info/pdf/publications/R7785.pdf]

Khan, A. R., Sen, B., 2001. 'Inequality and Its Sources in Bangladesh, 1991/92 to 1995/96: An Analysis Based on Household Expenditure Surveys', *The Bangladesh Development Studies*, Vol. XXVII, N0. 1, pp. 1-49.

Lee, D. B. Jr., 2000. 'Method for Evaluation of Transportation Projects in the USA, *Transport Policy*, 7(1), pp. 41-50.

Lee, N., & Dalvi, M. W., 1969. 'Variations in the Value of Travel Time', *MSESS*, Sep, 1969

Lema, C. I., 2000. *Rural Transport Infrastructure Improvement in Tanzania: Communities Ability and Willingness to Pay, MA Dissertation (Unpublished),* Institute for Transport Studies, The University of Leeds, Leeds

Lloyd, C., and Brandon, A., 1991. "Women's role in Maintaining Households: Poverty and Gender Inequality in Ghana" *Population Council Research Division Working Paper 25*, New York

Mackie P. J., Wardman M., Fowkes A. S., Whealan J., and Bates J., 2003. *Values of Travel Time Savings in the UK Summary and Conclusions, Report to the Department of Transport (UK).* [available online at:
http://www.dft.gov.uk/stellent/groups/dft_econappr/documents/pdf/dft_econappr_pdf_022708.pdf)

Ministry of Communications, 2001. *RHD Road User Cost Annual Report for 2000-2001*, Government of the People's Republic of Bangladesh, Dhaka

Morisugi, H., 2000. ‘Evaluation Methodologies of Transportation Projects in Japan’, *Transport Policy*, 7(1), pp. 35-40.

MVA Consultancy, ITS of the University of Leeds, and TSU of the University of Oxford, 1987. *The value of Travel Time Savings : A Report of Research Undertaken for the Department of Transport*, MVA Consultancy

National Bureau of Statistics, 2002. *Household Budget Survey: 2000/01*, National Bureau of Statistics, Dar es Salaam.

National Bureau of Statistics and Oxford Policy Management Ltd, 2000. *Developing a Poverty Baseline in Tanzania*, National Bureau of Statistics, Dar es Salaam.

Nelson, J. P., 1982. “Airport and property values: a survey of recent evidence”, *Journal of Transport Economics and Policy* 14: 37-52.

Ortuzar, J. de D., Willumsen., 1996. *Modelling Transport (Second Edition)*, Willey, Chichester

Pearmain, D., and Kroes, E., 1990. *Stated Preference Techniques : A Guide to Practice*, Steer Davies and Gleave Ltd., Richmond

Pendleton, L., and Mendelsohn, R., 2000. “Estimating recreation preferences using hedonic travel cost and random utility models”, *Environmental & Resource Economics,* 17 (1): 89-108.

Quinet, E., 2000. ‘Evaluation Methodologies of Transportation Projects in France’, *Transport Policy*, 7(1), pp. 27-34.

Rothengatter, W., 2000. ‘Evaluation of Infrastructure Investments in Germany’, *Transport Policy*, 7(1), pp. 17-25.

Shahabuddin, Q. and Rahman, K. M., 1992. *Estimation of Economic Prices for Use in FAP Planning Studies*

Smith, V. K., and Karou, Y., 1990. “Signals or noise ? Explaining the variation in recreation benefit estimates”, *American Journal of Agricultural Economics,* 419-433.

Squire, L., and van der Tak, H. G., 1975. *Economic Analysis of Projects*, Johns Hopkins University Press, London

Tengey, W., Glyde, S., and Kwashie, N. 1999. *Rural Transport Services and Gender in Ghana.* Study Report, Accra Department of Feeder Roads/World Bank

Thomas, S., 1983. 'The Value of Time Savings in West Malaysia: Car, Bus and Taxi Occupants', *TRRL Supplementary Report No 777*, Transport and Road Research Laboratory, Crowthrorne

United Nations Children's Fund (UNICEF), 2001. *Integrated Community Based Development: Household Baseline Survey*, Yendi District Assembly, Yendi

United Nations Development Programme, 2004, *Human Development Report 2004: Cultural Liberty in Today's Diverse World*, UNDP, New York

Vaidya, K., and Ahmed, F., 2004. "A Practical Methodology for Identifying Poor and Non-poor Travellers in Roadside Surveys in Developing Countries." *Proceedings for the 10th World Conference on Transport Research*, Istanbul, Turkey, July 4-8, 2004

Vickerman, R., 2000. 'Evaluation of Methodologies for Transport Projects in the United Kingdom', *Transport Policy*, 7(1), pp. 7-16.

Wardman, M., 1988. 'A Comparison of Revealed Preference and Stated Preference Models of Travel Behaviour', *Journal of Transport Economics and Policy*, XXII (1), pp 71-91

Wardman, M., 1997. *A Review of Evidence on the Value of Travel Time in Great Britain (Working Paper 495)*, Institute for Transport Studies, The University of Leeds, Leeds

World Bank, 1999. *Ghana: Women's role in improved economic performance: Africa Region Findings No.145*, World Bank, Washington D. C. [also available at: http://www.worldbank.org/afr/findings/english/find145.htm]

World Bank, 2003. *World Development Report 2004:* Making Services Work for Poor People, The World Bank Press, Washington D.C. [also available online at: http://econ.worldbank.org/wdr/wdr2004/text-30023/]

World Bank, 2004. *World Development Report 2005: A Better Investment Climate For Everyone*, The World Bank, Washington D.C. [also available online at: http://web.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTWDRS/EXTWDR2005/0,,menuPK:477681~pagePK:64167702~piPK:64167676~theSitePK:477665,00.html]

Yendi District Council, 2003. *Ghana Poverty Reduction Strategy: District Medium Term Development Plan: 2002-2004*, Yendi District Council, n.p.

Appendix I

## Definition of VoT, Theories Concerning VoT, General Methodologies for Valuing Working and Non-Working Time Savings, Methodologies for Valuing WTP, Relevant Issues in Valuing Travel Time Savings in Rural Areas of Developing Countries

THE VALUE OF TIME: A REVIEW OF THEORIES

It needs several elements to be brought together to develop a sound basis for valuing travel time savings. The most important among these is the adaptation of the classical theory of consumer behaviour in time allocation problems in relation to transport related attributes. The outcome of this exercise is a model which can be estimated empirically making use of the 'random utility' theory of discrete choice. MVA, ITS and TSU (1987) provides an in-depth theoretical overview of the relevant theories of the valuation of time in the transport context.

Adaptation of the classical theory of consumer behaviour in time allocation problems, utility maximization under different constraints, and simplification of the subsequent equations provide the following final equations:

$$(\delta U/\delta t_j)/\lambda = w + (\delta U/\delta t_w)/\lambda + (\varphi/\lambda) - (\psi_j/\lambda) \ldots\ldots (2.1)$$

$$(\delta U/\delta t_j)/\lambda = \mu/\lambda - \psi_j/\lambda \ldots\ldots (2.2)$$

Where, w is the wage rate, $t_w$ and $t_j$ are the time spent in work and activities other than work respectively, and $(\delta U/\delta t_j)/\lambda$ is the 'marginal valuation of time spent on activity j' – a ratio of marginal utility of time in activity j ($\delta U/\delta t_j$) and marginal utility of income ($\lambda$). The second, third and fourth terms in the right hand side of Eq. 2.1 are the marginal valuation of time spent on work, marginal valuation of time for decreasing the minimum working time required and marginal valuation of decreasing the minimum other time required respectively.

When $\psi_j$ is zero in Eq 2.2, i.e. when the time constraint does not bind, the marginal valuation of time in activity j is equal to $\mu/\lambda$, also known as the 'resource value of time'. It represents consumer willingness to pay to have the total time budget increased, although in reality complete relaxation of the time budget constraint is not feasible. This is interpreted as the marginal valuation of the 'pure leisure' time at the optimum.

It is important to clarify one point with regard to the value of leisure time. Eq. 2.2 shows that 'pure leisure' time has a value, as utility is derived from it. However, there is generally no value, at the margin, for the leisure time saved - any savings in one leisure activity can only be used in another leisure activity[15]. Given that saving leisure

[15] However, this may not be true in the case of transferring time from one leisure activity to another leisure activity that attracts higher utility.

time in one activity and transferring it to another activity will not increase an individual's utility, it is implicit that the consumer will not be prepared to pay to save any leisure time.

It is also important to differentiate between the marginal valuation of time and value of time savings. It was seen that while leisure time has a marginal value, the value of leisure time savings is zero. Now let us turn to other activities than leisure where the time constraint does bind[16], for example travelling. The difference between the marginal valuation of time spent on travelling (or activity i) and resource value of time (marginal valuation of pure leisure time) is $\psi_j/\lambda$. Therefore, a reduction of the amount of time spent on travelling (or activity i) and transferring it to leisure will increase utility, which is equal to $\psi_j/\lambda$. This is referred to as "the value of transferring time" or commonly as the "value of time". Hence the empirical interest in valuing time is centred on the value of $\psi_j/\lambda$. Also the marginal valuation of activities other than leisure will be less than the resource value. In the case of travelling, the marginal valuation of travel time, in most cases, will be negative as travelling contributes to disutility. Therefore, the value of $\psi_j/\lambda$ is never negative and will always be non-zero if someone is forced to spend more time in an activity than he or she ideally wishes.

## VALUATION OF WORKING AND NON-WORKING TIME SAVINGS

The theoretical framework explained in Section 2.0 is valid both in the developed and developing country context. Only the empirical approaches in the valuation of travel time savings may vary between developed and developing countries.

As mentioned before, in developed countries two distinctions are made when valuing travel time savings: working and non-working time savings. The general approach of such valuations is given below.

### Valuing working time savings

Time savings while travelling for work is the marginal value of working time – unlike for other activities, it is the difference in value between marginal value of time for the particular activity and leisure time. The value of working time savings for a travelling employee is taken as the marginal valuation of employee's time to the employer. The classical economic theory of marginal productivity, which maintains that labour will be hired up to the point where the marginal value of an extra unit of labour is equal to the cost of that unit, underlies the valuation of the working time savings. The value of working time savings is generally taken as the wage rate plus other costs, for example, employment taxes, other compulsory contributions, and an allowance for overheads, to keep someone employed. An important assumption for this valuation of working time savings is that the employee will behave in such a way that he/she has personally accepted such a valuation. However, there may be many reasons for failure of such theory in practice, among other, monopolistic practices in labour

[16] Also referred as "intermediate activities."

market, limited possibilities in substitution between labour and capital, and divergence from the profit maximising assumption of the traditional theory. The implications of these arguments are very difficult to ascertain. Given the practical difficulty in assessing the implications of failure of the theory, it is an accepted practice to value the working time savings equal to the wages plus the on-costs.

The aforementioned approach makes several implicit questionable assumptions: a full transfer of work related travel time saved to work only; a non-productive use of travel time i.e. employee does not use any of the work travel time for productive purposes[17]; and a similar utility of time spent on work compared to travelling. Against such criticism, the following formula was proposed by D A Hensher in late 1970s, also known as the Hensher model, for valuing work related travel time savings (Booz-Allan& Hamilton, 2000):

$$VTTS = (1 - r - pq) * MP + \frac{1-r}{1-t} * VW + \frac{r}{1-t} * VL + MPF$$

Where:

VTTS = value of travel time saved;
r = proportion of travel time saved which is used for leisure;
p = proportion of travel time saved at the expense of work done while travelling;
q = relative productivity of work done while travelling compared with the equivalent time in the office;
MP = the marginal product of labour;
VL = the value to the employee of leisure relative to travel time. Traditional behavioural value of time;
VW = the value to the employee of work time while in the office relative to travel time;
MPF = the value of extra output generated due to reduced fatigue; and
t = employee's personal tax rate.

It is to be noted that there are four main elements of the formula – a productive effect, a relative disutility cost, a loss of leisure time and any compensation transfer from employer to employee. However, use of Hensher model in valuing work travel time saving is marginal given the difficulty in making it operational in practice. The Hensher model has been used for the valuation of work related travel time savings concerning business air travel and commercial car travel in countries like Australia, Sweden, UK and the Netherlands (Booz-Allan& Hamilton, 2000).

Valuing non-working time savings

Unlike the values of working time savings, the value of time savings for a particular activity other than wage earning work (non-working time savings) is the difference between the marginal valuation of time for the particular activity and leisure. The values of non-working time savings are assessed empirically using stated or

[17] for example, the employee may still be working on a train using a lap-top

behaviourally revealed values. These stated or behaviourally revealed values are considered as someone's willingness to pay for preferring to have travel times saved and transferring them to leisure activities. For example, if a rational person chooses, either by showing behaviourally or by stating such intention when asked under controlled experimental conditions, an expensive but faster mode over a cheap but slower mode of transport then it is implicit that he/she is prepared to make a trade off in favour of time at the expense of money. This shows his/her willingness to pay for avoiding the extra time in a slower transport mode and transferring the amount of time to leisure.

The most common theoretical framework for empirical measurements of the non-working time savings is based on the discrete choice model that hinged on the framework of the random utility theory (Ortúzer and Willumsen, 1996). The random utility theory postulates that all behaviour of a rational person is explained by his/her desire to maximise utility apart from random variations in behaviour due to errors in measurement by the analyst, errors in the perception of the individuals and variation of taste between individuals. In the case of transport it practically means that a rational person will choose a mode or an option that gives him/her the greatest net utility. For instance, say there is a set $A = \{A_1, A_2, \ldots A_n\}$of available mutually exclusive alternatives and a set of X vectors of measured attributes of the individuals and their alternatives. Now, If a person q is endowed with a set of attributes $x \in X$ and in general will face a choice of $A(q) \in A$. Each option $A_j \in A$ has an associated net utility of $U_{jq}$ for the individual q. The utility $U_{jq}$ has two portions – a measurable, systematic and representative part ($V_{jq}$), which is a function of the measured attributes x, and a random portion $\varepsilon_{jq}$, which reflects the random variations in behaviour due to errors in the perception of the individuals and variation of taste between individuals and the measurement errors made by the modellers. The individual q will select alternative $A_j$ only if $U_{jq} \geq U_{iq}$, under a condition that for all $A_i \in A(q)$. The simplest assumption of such utility is that they are linearly additive and compensatory – alternatives between which choices are made are characterised only by utility. For instance, the simple form of compensatory utility model, which is frequently used in transport, may take the following general linear form:

$U_i = a_0 + a_1 X_1 + a_2 X_2 + \ldots a_n X_n$ ; where $U_i$ is the utility of the option i, $X_1 \ldots X_n$ are the product attributes, $a_1 \ldots a_n$ are the model coefficients, and $a_0$ is the model constant.

The framework of discrete choice models, making use of disaggregate data on individuals' choices between specified alternatives, are used for valuation of non-working travel times savings. There are certain advantages of such disaggregate models, *inter alia*: they are based on individual choices and therefore the models attempt to explain individual behaviour; they are more efficient in information usage as they make use of individual data which facilitate the use of inherent variability in the information; and they can be used at any aggregation level. These derived values, an end product of the modelling process using the observed behaviour or reported potential behaviour, are known as "behavioural values of time". However, often these values may not be agreed by the policy makers for use in transport

project appraisal due to: (i) misperception by the individual; (ii) taxation and subsidies such that the cost affecting the individual is not the true resource cost; (iii) individual values are all short run, but public transport policy involves long run consideration. Therefore, these values are often converted to resource values by multiplying them with some factors.

Given that the non-working time savings is the willingness to pay for saving travel time and transferring that amount of time to leisure, its values are dependent on the respondent's social, economic, demographic characteristics or on other factors. The following personal and travel attributes may contribute to major variations in the valuation of non-working time savings: (i) household income; (ii) household composition; (iii) person type; (iv) journey purpose; (v) out of vehicle time during the journey (for example, walking and waiting time) (vi) season/day of travel (for example, busy vs. lean time of the year, market vs. non-market day; (vii) mode of travel; and (viii) amount of time savings.

## ESTIMATION OF THE WILLINGNESS TO PAY FOR THE VALUATION OF NON-WORKING TIME SAVINGS

The willingness to pay for a preference can be identified in two major ways: Revealed Preference (RP) and Stated Preference (SP). RP is based on the actual choice framework. By observing the choices made between alternatives with specific attributes we can estimate the values of different attributes – including time. For instance, if an individual is faced with two choices for going from A to B – travelling by train which is faster but expensive or travelling by coach which is slower but cheaper. Say the times and costs for travel are $T_t$ and $C_t$, and $T_c$ and $C_c$ for train and coach respectively. Then the time and cost differences are $(T_c-T_t)$ and $(C_t-C_c)$ respectively. Under this circumstance the boundary value of time is $\{(C_t-C_c)/ (T_t-T_c)\}$- which practically means that any individual with value of time equal to $\{(C_t-C_c)/ (T_t-T_c)\}$will be indifferent between the train and bus. All else equal, an individual with value of time higher than $\{(C_t-C_b)/ (T_t-T_b)\}$ would choose train or vice versa. The choice outcome of the RP study is the known outcome, which is the only response. Conceptually this should be the most realistic way for evaluating the values of time since it reveals the choice in the real world. However, it tends to be expensive as only one decision per respondents can be analysed. Another major pitfall of the RP study is that, when a range of choices exists, direct evidence only exists on the alternative chosen and not on the alternative rejected. Also, in the case where no trade-offs exist, no information can be generated. In addition, a RP study is ineffective in cases where new transport interventions are under consideration, which necessitates the use of hypothetical scenarios for evaluation of the impact of the new interventions. Hine, Pangihutan and Rudjito (1998), from an Indonesian study, confirmed that it is difficult to use RP methods in the meaningful valuation of travel time savings when there is a limited range of choices.

SP methods offer the opportunity to overcome the limitations of the RP methods in modelling travel choices. SP experiments present the individuals with hypothetical

travel choices and seek their preferences. This is done through offering respondents different alternatives designed to give several credible hypothetical trade-offs in their travel decision making. SP methods have become the main methods in determining the travellers' time values. The UK experienced a diminished use of RP methods in the valuation of travel time savings from early 80s to late 90s. This is due to two reasons: (i) in the early 80s some VoT studies were successfully conducted using the SP methods in the UK; and (ii) it was found that there was a reasonable degree of correspondence between the value of time estimates using RP and SP methods (Wardman, 1997). Since late 90s use of RP methods has become non-existent.

One of the main reasons for the overwhelming popularity of the SP methods originates from the fact that the researcher can precisely control the choices offered to respondents and thereby can ensure data of sufficient quality to construct a good quality statistical model. This is in contrast to RP methods where the observations may not vary sufficiently to construct a creditable model (Pearmain & Kroes, 1990). This inherent advantage of the SP methods allows the separation of effects of variables of interest from the effects of other factors. Other advantages of the SP methods include their use in a hypothetical situation where potential interventions are planned and the generation of multiple observations per individual given that the respondents are asked to consider a number of situations. The main criticism of the SP techniques lies in the fact that it may not correspond closely to actual preference of the respondents; this may be due to the systematic biases in the SP responses or difficulty of designing and carrying out the SP experiments (Wardman, 1988). These drawbacks were, perhaps, the reasons for some degree of skepticism among economists on the use of SP methods.

An alternative to the direct methods for valuing time based on the random utility model is the hedonic pricing model that attempts to estimate the value of time and other attributes through their effect on the value of residential property or land or wage rate. For example, a location near an airport may be expected to have a negative effect on the value of a house whereas a location near amenities (places of employment and schools and areas of natural beauty) would have positive effects (Nelson, 1982, Smith and Karou, 1990 and Braden and Kolstad, 1991). Pendleton and Mendelsohn (2000) show that random utility and hedonic travel cost models are based on a similar theoretical framework.

## PRESENT APPROACHES TO VALUATION OF TRAVEL TIME SAVINGS IN DEVELOPED AND DEVELOPING COUNTRIES

Developed countries

**Table I- 1**[18] provides the summary of the approaches undertaken in some of the selected developed countries for travel time savings valuation. A close examination of **Table I- 1** shows the following:

(i) Approaches to the valuation of travel time savings and the values of time vary a great deal among developed countries;

(ii) Some countries, like the UK, USA and Germany, differentiate between working and non-working time savings and others simply use a unique value, like France, Japan, Austria, Belgium and Greece;

(iii) Categorisation of time saving values also varies widely; and

(iv) Whilst valuations of working time savings are based on wage rates, the non-working time savings are mainly valued using RP or SP approach.

Bristow and Nellthorp (2000) present the range of variation of working and non-working time saving values in different European countries – values of working time savings range from 5.3 to 19.5 US$ per hour per person and values of non-working time savings range from 2.0 to 4.5 US$ per hour person. Non-working time savings vary between 10 to 42% of the working time values in Europe (Bristow and Nellthorp, 2000).

[18] Summarised from Vickerman (2000), Rothengatter (2000), Quinet (2000), Morisugi (2000), Lee (2000), Bristow & Nellthorp (2000) and Hayashi & Morisugi (2000)

**Table I- 1: Comparison of Approaches to the Valuation of Travel Time Savings and Standard Values in Selected Countries**

| Country | Method | Categories | Working VoT US$/hr/ person | VoT (non-working) US$/hr/ person | Other Remarks |
|---|---|---|---|---|---|
| UK | Working time based on wage rate. Non-working time based on SP or RP studies | Values Differentiated by vehicle types and driver/passenger for each of working non-working categories | 18 (car) | 4.4 (unique value for all vehicles) | No differentiation by time of the day or non-working time trip type. Cargo time values not specified |
| France | Wage rate approach or SP or RP studies | Unique value for working and non-working time | 4.5~19 (depending on the type of project) | | Values differ for different project type with road project has the lowest value |
| Japan | Mainly wage rate approach | 5 categories depending on vehicle categories and 2 categories for type of day (weekday or holiday) | 19.5 (car weekdays) 21 (car weekends) | | No differentiation by trip purpose. VoT does not depend on time of trip and other |
| USA | Wage rate approach (basically for working hour) or SP or RP studies | Working travel is valued at wage rate and personal travel at lower fraction of the wage rate on the trip purpose | 8~40 | | The cargo time values are routinely used primarily representing inventory costs. |
| Germany | Mainly wage approach adjusted by WTP using SP. Non-working time values also adjusted for small time savings | 2 categories of purpose; 4 categories of cars; one category of rail | 13.5 (car) | 2.6 (car) | The cargo time values are not specified |
| Austria, Belgium and Greece | Not available | Unique value for working and non-working time | Not available | Not available | |

Valuing working and non-working time savings – the UK approach

The following paragraphs detail the UK standard approach to the valuation of the working and non-working travel time savings. UK has been chosen as a typical case from developed countries as: UK is one of the few countries in the world where the VoT issues are addressed in a systematic way by conducting a comprehensive "stand alone" study on travel time savings valuation (like MVA/ITS/TSU, 1985) and the concepts and results are subsequently reviewed through another study (HCG & Accent, 1996); concepts and results are well documented and easily available; some spin off studies related to the VoT are also conducted which facilitates an in-depth understanding of the issues related to the VoT. This in-depth review of the UK approach helps in drawing lessons for VoT research in developing countries.

*Working time savings*

In the UK working time savings apply only to the time saved while making a journey in the course of work. The UK government standard approach, as stipulated in Department of Transport (1995), is to add an on-cost of 36.5% of the gross wage or salary costs on top of average wage rate. This on-cost represents the overheads such as national insurance, pensions and other costs. Different working time values are suggested for passengers and drivers of different modal groups, like car, bus, rail and underground. Working time saving values differ considerably across different transport modes. For example, the suggested working time value for rail passengers is approximately 50% higher than other public service passengers (e.g. coach passengers). These suggested values are based on the results of National Transport Surveys of 1985/86. An average value of £12.77 per hour (1994 prices) per traveller has been suggested for all workers irrespective of the mode use. The same value has been suggested for waiting, walking and travel in a vehicle. One of the main criticisms of this approach is the assumption of full employment – implicitly assuming that when the time saving occurs, there is additional work for the labour to do (valued at the marginal productivity of labour, proxied by the wage rate) or the labour is released in the market where it is rehired at the existing wage rate. Therefore, the acceptance of wage rate approach in the valuation of working time savings seems to be generous without it is shadow priced to reflect its true resource value.

*Non-working time savings*

Non-working time value applies to all non-work journey purposes, including travel to and from work places, by all modes. The value of non-working time suggested by Department of Transport (1995) is based on the research conducted in the 1980s by MVA/ITS/TSU (1985) that uses the SP approach in the derivation of values. This study was the first major value of time study undertaken. The suggested in-vehicle time (IVT) resource value by the Department of Transport is £ 3.15 per hour (1994 prices) per traveller, about a fourth of the working time values for all workers. This non-working time value represents the resource value as it is adjusted downward for taxes and subsidies (a reduction of 17.3% has been made from perceived values).

The suggested walking and waiting time saving values are double the IVT value. It is also suggested to up-rate both working and non-working time values in proportion to average employee earnings.

One of the main criticisms of a unique non-working time value is that although justified based on equity, it is flawed when considered from an efficiency point of view.

Developing countries

To date attention has been paid on valuing time in the more economically advanced countries of the world. In cases where specific attention has been paid to valuing time in developing countries, the focus is has been by regular motorised modes generally in an urban or inter-urban context, or the country is at the limits of the term "developing" Again, there is a paucity of "stand alone" research on valuation of time in rural areas; most estimates have been made as part of an individual appraisal exercise. The estimates are mainly made using the revealed (modified) preference approach and only in a few cases using the SP approach (also modified). The available estimated values of time in developing countries, tabulated in chronological order, are presented in Table I- 2.

The following are the conclusions after the review of the literature on the valuation of travel time savings in developing countries:

(i) A distinction is rarely made between working and non-working time savings even in the case of urban and inter-urban travel;

(ii) Only in a few cases have preference approaches been used for time valuation; the majority of the approaches involve the use of indirect indicators such as Gross Domestic Product (GDP), wage rates, and Regional Domestic Product (RDP)[19] for the valuation of time. In rural situations, all studies use the indirect RP approach. Again there are two main variants of this approach:

    i. The first is to base time values on a common per capita GDP value for all travellers regardless of age, gender or economic activity. Generally the per capita GDP is divided by a nominal number of hours per year, and then the resulting hourly time value is adjusted for trip purpose with the objective of screening out "non-productive" trips[20]. The figure of 2000 is a little higher than the 160 hours per month suggested for developing countries (Gwilliam, 1997). The advantage of the approach is that it is economic and needs surveys only to

[19] In some countries data are available on Regional Domestic product (RDP)

[20] A productive trip is any trip the purpose of which is to contribute to the household's productive capacity. In a near-subsistence economy this also includes the provision of household inputs [fuel, water etc.] which would otherwise require a cash transaction.

determine trip purposes if such data are not already available from other studies. As no distinction is drawn between different categories of travellers, it is a more equitable approach as well.

ii. The second is a refinement of the first one and uses the disaggregate income data for travellers. This is calculated from household income and income earner per household, and using different modes of transport. The added attraction of this modified approach is the increasing availability of such data. This is due to a growing concern with poverty, including its measurement and the poverty reduction policies. Modes are assigned to household income levels by transport ownership data from surveys. The hourly time values are adjusted for non-productive trips and shadow wage rates. However, this approach is criticised on the ground of equity.

(iii) Where the travel time valuation involves the use of the SP approach, questionnaires designed following proper experimental design procedures are rare. Generally, an approach close to the "transfer price"[21] approach is used (Thomas, 1983). Also the approach involving a bidding process is not uncommon (Hine, Pangihutan & Rudjito, 1998). The irrational use of SP approach may have produced erroneous results in some cases. This may have resulted in an apparent apathy about the approach among the transport professionals in developing countries (Ministry of Communications, 2001).

(iv) Close observation of Table I- 2 shows:

i. Different studies come up with widely differing time values. For example, in Brazil the time value of a car/taxi passenger is 362% of the GDP per productive hour[22] compared to Kenya's 45% and Dominica's 48%.
ii. Users of faster and more comfortable modes have higher time values than the users of less efficient modes;
iii. The majority of the studies calculated VoT on the basis of revealed mode use characteristics of the users.

[21] First Proposed by Lee & Dalvi (1969). An estimate of the money value for someone to force from his chosen alternative to next best one. A typical transfer price question is like: how much would the respondent's chosen alternative have to rise in order for the respondents to switch to next best alternative?
[22] Taken as 2,000 hours per year

Table I- 2: Hourly time values, by mode, 1978-2001 (Values in US$)

| Country | Year | Exchange Rate/USD | Per Capita GDP [$] | Car Taxi | LCV 4WD | Bus Mini | Large | Truck | Motor Cycle | Auto Rickshaw | Rickshaw | Bicycle | Pedestrian | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Malaysia | 1978 | 6.8 | n.a | 0.42 | | | 0.20 | | | | | | | [a] |
| Brazil | 1995 | 1.00 | 2419 | 4.38 | 2.18 | 0.87 | 0.78 | | | | | | | [b] |
| Jamaica | 1995 | 39.62 | | 2.12 | 0.15 | 0.55 | 0.55 | 0.15 | | | | | | [c] |
| PNG | 1995 | 1.34 | n.a | 0.98 | 0.34 | 0.22 | 0.22 | | | | | | 0.09 | [d] |
| Ethiopia | 1996 | 6.34 | 81 | 0.08 | 0.08 | 0.02 | 0.02 | | | | | | | [e] |
| Kenya | 1996 | 46.20 | 1500 | 0.06 | 0.06 | 0.05 | 0.02 | | | | | | | [f] |
| Bangladesh | 1997 | 42.45 | 220 | 0.79 | 0.79 | 0.23 | 0.23 | | 0.36 | 0.13 | 0.09 | 0.18 | 0.03 | [g] |
| Dominica | 1997 | 2.72 | 2174 | 0.52 | 0.68 | 0.35 | | | | | | | | [h] |
| Jamaica | 1997 | 35.00 | n.a | 2.12 | 0.15 | 0.55 | 0.55 | 0.15 | | | | | | [c] |
| Kenya | 1998 | 62.50 | 1500 | 0.34 | 0.48 | 0.23 | 0.23 | 0.64 | | | | | | [f] |
| Somalia | 1998 | 3800 | 81 | 0.10 | 0.10 | 0.03 | 0.03 | | | | | | | [i] |
| Indonesia | 1998 | | | 5391[23] | | | 2756 | | | | | | | [j] |
| Vietnam | 1999 | 10000 | | 0.11 | 0.11 | 0.11 | 0.11 | | 0.09 | | | 0.03 | 0.02 | [k] |
| Ethiopia | 1999 | 7.30 | 104 | 0.10 | 0.10 | 0.03 | 0.03 | | | | | | | [e] |
| Uganda | 1999 | 1475 | 187 | 0.07 | 0.07 | 0.07 | 0.07 | | | | | 0.027 | | [l] |
| Lesotho | 2000 | 6.00 | 320 | 0.30 | 0.26 | 0.07 | 0.03 | | | | | | 0.07 | [m] |
| Ethiopia | 2001 | 8.34 | 105 | 0.11 | 0.11 | 0.03 | 0.03 | | | | | | 0.01 | [e] |

**Notes:**

| Note | Basis of Estimate | Work Time Included | Non-Work Time Included | Trip Purpose Surveys |
|---|---|---|---|---|
| [a] | Stated Preference | No | Yes | Yes |
| [b] | RDP/capita | Yes | Yes | Yes |
| [c] | Client | | | |
| [d] | Wage rates | Yes | No | Yes |
| [e] | GDP/capita | Yes | No | Yes |
| [f] | RDP/capita | Yes | Yes | Yes |
| [g] | Disaggregated Data | Yes | Yes | Yes |
| [h] | GDP/capita | Yes | Yes | Yes |
| [i] | As for[e] | Yes | No | No |
| [j] | Stated Preference | No | Yes | Yes |
| [k] | Disaggregated Data | Yes | Yes | Yes |
| [l] | Client/Rural GDP | Yes | No | Yes |
| [m] | GDP/capita | Yes | No | Yes |

[23] Figures in Rupaiya

Gwilliam (1997)[24] tried to rationalise the approaches by providing guidelines on the VoT savings, although the suggested values are not based on empirical findings in developing countries.

## RELEVANT ISSUES IN THE VALUATION OF TRAVEL TIME SAVINGS IN THE RURAL CONTEXT OF LDCS

### Relevance of division of time savings into working and non-working classes in the context of rural areas of LDCs

This is one of the main conceptual issues that need resolving in the valuation of travel time savings. This arises as there is a marginal formal employment in rural areas of developing countries. Another question still remains unresolved. Do the working trips need defining differently in the case of rural areas of developing countries in comparison to their developed country counterparts or their urban counterparts?

### Preference approaches in a subsistence context

The values of non-working time savings are assessed empirically using revealed preference of the travellers, or inducing travellers to state their preference, indicators of willingness to pay for their preference. The use of preference-based approaches to valuing travel time savings is viewed with suspicion in the context of the rural subsistence economy. The question is often asked, “how a traveller can attach a cash value to his preference when the use of cash is marginal?” This question is valid in, perhaps, the majority of the rural areas of developing countries.

### Use of SP vs. RP approach for the measurements of WTP

Section 4.0 explains the advantages and disadvantages of the RP and SP approaches. Both the approaches have been tried in one or other form in rural areas of LDCs. However, their systematic applications appear to have been absent if the studies reviewed are considered. In the majority of the cases where the RP or SP approach was adopted, it was applied in a modified form. For example, in all studies where the SP approach was adopted, either the “transfer price” or “bidding process” method was used for time valuation (Lema, 2000, Hine, Pangihutan and Rudjito, 1998). These methods of SP are not generally recommended as they are subjected to strategic biases[25]. On the other hand the RP approach was also used in its modified form – only

[24] Latest World Bank guidance (Gwilliam, 1997) on this issue suggested a value of 133% of the wage rate for work and business trip time; and 30% and 15% of household income for non-work trip time for adult and children respectively in all countries. This suggestion is mainly based on the empirical evidences from developed countries and middle income countries.

[25] One of the potential biases of the SP response. It is due to the distortion of valuation of public goods by people to suit their vested interest.

taking a fraction (depending on the proportion of the "productive" trips made by the occupants of the particular vehicle) of the income of the vehicle owning household as its VoT. Therefore, if the preference approach is suitable at all, which of the two methods is most suitable?

Non-clarity between marginal value of leisure time and VoT

In some cases, even development professionals mix up the marginal value of leisure time with the VoT (value of travel time savings) and, therefore, try to ascertain the trade-off between income and leisure[26]. As discussed before, there is a difference between marginal value of leisure time and the VoT. While leisure time has marginal value, generally the value of leisure time savings is zero. However, the difference between marginal valuation of time spent on travelling and marginal valuation of leisure time is the VoT or "the value of transferring time." It is conceptually inaccurate to question the productive use of the saved travel time while valuing travel time savings. This valuation simply reflects the traveller's willingness to pay for his/her preference to transfer saved travel time to leisure.

Perceived values of time vs. resource values of time (or behavioural value vs. resource value)

Although adjustments for taxes and subsidies are made to convert perceived values of non-working time savings to resource values in developed countries, such as in the UK, no such adjustments are made in the case of working time savings. This is mainly due to the implicit assumption of full employment and negligible effect of taxes and subsidies on the resource costs. The validity of such assumption is not beyond criticism. However, adjustments (shadow pricing) will be needed for both working and non-working time savings in developing countries to determine true resource values. Adjustments (shadow pricing) for the working time savings – which is linked to the wage rate - are necessary in developing countries. This is due to the existence of unemployment and underemployment, co-existence of formal and informal employment sectors, and existence of tax and subsidies. An adjustment (shadow pricing) for non-working time savings, which represent the willingness to pay to transfer time to leisure that otherwise would have been used on travelling, is necessary to take into account the effects of taxes and subsidies.

Potential variation of travel time savings

- **Income of the Travellers:** This may be one of the major sources of variation. Indonesian experience shows that the VoT increases with household income but less than proportionally (Hine et al., 1997).
- **Person type:** VoT may vary with the type of traveller, for example men vs. women, major wage earner vs. non-earner etc.

[26] It is often argued that the saved travel time is not used in productive purposes, rather used in leisure, so why attach value to saved time.

- **With and without load travel:** This is one of the crucial issues in the rural context in LDCs as significant numbers of trips are made with load, which is irrelevant in developed or middle-income countries' context.
- **Seasonal variation:** Unlike urban areas of developed or developing countries, time values in rural areas are expected to vary in harvesting time, when the family time budget is tight, compared to non-harvesting time. It may also vary in the wet season compared to the dry season.
- **Daily variation:** Another factor that may influence the VoT in rural areas of developing countries is the day of travel – especially market and non-market days.
- **Modal variation:** This type of variation is applicable in developed countries as well as developing countries. Table I- 2. shows that the VoT differs between modes of transport.
- **Variation due to infrastructure types:** Evidence from Tanzania (Lema, 2000) suggested that there might be a variation of valuation of time depending on the quality and remoteness of the infrastructure from main roads.

## Bangladesh Rural Travel Time Saving Values

| Base values of travel time savings | Men | Women | Average |
|---|---|---|---|
| In-vehicle time | 4.75 Tk/hr | 2.25 Tk/hr | 3.50 Tk/hr |
| Walking time | 5.16 Tk/hr | 2.66 Tk/hr | 3.91 Tk/hr |

| Additional computed values | |
|---|---|
| Uncomfortable travelling conditions | 2.29 Tk/hr |
| Market day | 1.47 Tk/hr |
| Salaried or traders | 14.72 Tk/hr |
| Social and leisure | Not an additional factor |
| Travelling with a load | 0.48 Tk/hr |
| Poor traveller | 0.31 Tk/hr |
| Poor road | Not an additional factor |
| Wet season | Not an additional factor |
| Mode of transport (bus/rickshaw van) | Not an additional factor |

Note: Tk/hr is Bangladesh Taka per hour. 1 US$=57 Taka or 1 Taka is equivalent to US$ 0.0175 (as of end-2001)

## Basic Facts: Ghana and Tanzania

| | Ghana | Tanzania |
|---|---|---|
| **Basic Socio-Economic, Geographic Profile** | | |
| Area (sq km) | 239,000 sq. km | 945,000 sq. km |
| Population (year?) | 18.91 Million [b] | 35 million [c] |
| Population density (population per sq km | 79.3 [a] | 40 [c] |
| % of population living in urban areas | 44% [a] | 13% [e] |
| Annual Population Growth | 2.7% [a] | 2.6% [d] |
| Life Expectancy at birth (2002) | 55 years [d] | 43 years [d] |
| Population below poverty line | 39.5% [d] | 35.7% [d] |
| **Economy** | | |
| GDP size (2003) | $7.7 billion [g] | $9.9 billion [g] |
| Gross National Income (2003) | $6.6 billion [g] | $10.2 billion [g] |
| PPP Gross National Income (2002) | 40 billion [c] | 19 billion [c] |
| GNI per Capita (2002) | $ 320 [g] | $ 290 [g] |
| GDP growth (2001/02) | 4.5% [c] | 5.8% [c] |
| *Value added (% of GDP)* | | |
| Agriculture (2003) | 35 [d] | 43 [d] |
| Industry (2003) | 25 [d] | 17 [d] |
| Services (2003) | 40 [d] | 40 [d] |
| **Macro-economy & Trade** | . | |
| Export earnings 2003 | $1,945 million [d] | $990 million [d] |
| Import payments 2003 | $3,225 million [d] | $2,120 million [d] |
| Current Account Balance (2003) | $ -106 million [d] | $-964 million [d] |
| External Debt (2002) | $7,244 million [d] | $7,338 million [d] |
| Debt as a % of GNI ( 2002) | 19% [d] | 73% [d] |
| Official Development Assistance received ($ per Capita (2002) | $33 [d] | $35 [d] |
| Foreign Direct Investment inflow (2002) | $50 Million [d] | $240 Million [d] |
| Rate of Inflation rate (2003) | 26.9 % | 4.4 % |
| **Selected Service Indicators** | | |
| Primary pupil-teacher ratio | 33 [c] | 40 [c] |
| Child immunisation rate | 81% [c] | 83% [c] |
| Physicians per 1000 people | 0.1 [c] | <0.1 [c] |
| Access to improved water source (% of population) | 73%[c] | 68% [c] |
| Access to improved sanitation facilities source (% of population) | 72 [c] | 90 [c] |
| **Human Development** | | |
| Human Development Index (2002) | 0.560 [f] | 0.407 [f] |
| Human Development Index Rank | 131[f] | 162 [f] |

Main sources: [a] GPRS; [b] 2000 population & housing census; [c] WDR 2004; [d] WDR 2005 [e] Tanzania Poverty Reduction Strategy Paper; [f] UNDP (2004); [g] http://www.worldbank.org/data/countrydata/countrydata.html

# Road Selection Criteria

**Road Scenario 1:**
A recently improved road with bus/minibus and/or other transport (e.g. bicycle taxi) services that ply in a regular interval (say an hour interval). The transport services have designated but frequent stoppages. Passengers are aware of the timing of services – although the service operators do not usually maintain the schedule strictly. People also use the buses/minibuses to carry a small quantity of business or agricultural products (normal load) by paying for the load. Bus/minibus services are generally crowded. Although there exist 'good' bus/minibus services, a considerable numbers of people still walk or use other Intermediate Means of Transport (IMT) like bicycle taxis.

***Existing transport services and their use:***
- A considerable use of bus/minibus services mainly by the non-poor as well as by the poor, although less extensively;
- Also a significant use of Non-motorised Transport (NMT) (e.g. bicycles). They are used both by the poor and the non-poor;
- A number of people still walk.

**Road Scenario 2:**
A poor road, improved long ago but fell into disrepair due to non-maintenance. Bus/minibus and/or other transport (like motorised three-wheeler) services operate on the road. However, they take considerably longer time to travel, with frequent stoppages. Travellers roughly know about the timing of the motorised transport services. Some people also carry load on a bus or on a minibus. The bus operators charge them for the load. The services are generally very crowded. However, people mainly walk or use other intermediate means of transport.

***Existing transport services and their use:***
- Some use of bus/minibus services;
- A considerable use of Non-motorised Transport (NMT) (e.g. bicycle-taxis);
- A considerable majority of the people still walk.

**Road Scenario 3:**
A poor earthen road, never improved, with seasonal bus/minibus or other motorised transport services - during the dry season only. It takes very long time for the bus and other motorised transport services to travel and they also stop frequently in undesignated stoppages. Travellers are roughly aware of the timing of the bus and other motorised services. Some travellers also travel with normal agricultural or business products by paying extra for the additional loads. The services are always crowded. An overwhelming majority of the travellers walk or use bicycles.

***Existing transport services and their use:***
- Roads seasonally served by buses/minibuses;
- Insignificant use of other motorized vehicles like motor-cycle, motorized three-wheelers etc.;
- A significant number of Non-motorised Transport (NMT) (e.g. bicycle taxis);
- An overwhelming majority of the people walk.

# Description of Study Roads

## Ghana

| Study roads | Description |
|---|---|
| Jimli - Yendi portion of the road Tamale – Yendi Road (Regional road, paved) Length – 61.7 km | Part of the road that connects Tamale (Regional Capital) to the Yendi, District Capital. A bituminous road that is recently been improved. The road passes through a number of small rural settlements. The terrain is flat and covered with flora typical of the Guinea Savannah area. A wide range of transport modes are available along this stretch of road: minibuses, Mammy Wagons, Benz buses, tractors, motor-bikes etc. |
| Kulugini – Sekpe road (Feeder road, gravel) Length – 21.2 km | Connects Kulugini (a settlement on the Tamale-Yendi road) to Sekpe (a small settlement with a small market) and passes though one rural settlements at Zakpalsi. The terrain is flat. The road is in fair condition. The road was gravelled about 4 years ago (2000); since then it was graded only once (2001). Some parts of the road have started to deteriorate. The road is served by both motorised (mainly minibuses and Mammy Wagons) and non-motorised transport (bicycles). There is a minibus service between Kulugini-Sekpe that runs twice a day. Mammy Wagons run on this road only on market days; approximately three Mammy Wagons come to Sekpe on a market day. |
| Jimli-Chegu (Feeder Road, gravel) – 9.0 km | Part of the Jimli-Palaguni road passes through flat terrain. Chegu is a small settlement on the road. A poor road that has fallen into a condition of disrepair due to the non-maintenance. Mammy wagons are the main motorised mode on this road; the road is also occasionally served by minibuses. Mammy wagons and minibuses are not able to serve the full length of the road during rainy season. There are many bicycles on the road. |

## Tanzania

| Study roads | Description |
|---|---|
| Moshi-Himo Trunk Road (Parts of T2 and T21), paved Length – 25.0 km | Road links Moshi to Himo and branches off to Tanga and Dar es Salaam. Roads continues to Marangu and Rombo and to Taveta Border with Kenya. Good tarmac road and passable throughout the year. It receives regular maintenance. Main ethnic groups live along the road corridor are: Chaggas and Pares. Main crops grown here are maize and beans. There are two main markets on this road : Himo and Uchira. The road carries different types of motorised and non-motorised vehicles: heavy lorries, large buses, minibuses, small vehicles motorcycles, and bicycles. There is no seasonal influence on the modal mix travel costs and travel time. There are schools, dispensaries, fuel stations on both sides of the road. |
| Moshi-Lyamungo Kijiweni, District road, gravel Length-15.2 km | Fair to poor quality gravel road passes through hilly terrain and very fertile agricultural land. Connects Moshi-Arusha Highway Junction up to Lyamungo-Kijiweni (central) via Umbwe (Kibosho). Mainly one ethnic group lives along the road corridor: Chaggas. Main agricultural products are bananas, coffee, beans and maize. The road can be slippery during the rainy season but passable. Last improvement was made five years ago. Carries both motorised and non-motorised traffic: minibuses, pick-us, small vehicles, medium sized lorries, motorcycles and few bicycles. The volume of motorised transport reduces substantially during rainy season due to slippery surface conditions. Such conditions also increase the travel time on this road. |
| Uchira – Kisange Sangeni (District Road), earth Length: 8.6 km | Very poor earth road. Links Uchira at the Himo-Moshi Trunk Road to Kisange Sangeni village via Miwaleni village. There are three ethnic groups live along the road corridor: Chaggas, Pares and Kahes. Main agricultural products on this road corridor are: maize, beans, paddy and vegetables. It is only passable during the dry season. Only non-motorised transport (bicycles, often operate on hire basis) operates on this road. Bicycle tariffs are far higher in rainy season than in dry season. It also takes substantially longer time to travel in rainy season. People living on this road corridor appear to be much poorer than those in other two road corridors. |

## Sample Quantitative Questionnaires

## SAMPLE HOUSEHOLD SURVEY QUESTIONNAIRE

| | | | |
|---|---|---|---|
| **Village** | | **Interview Time** | |
| **Household ID #** | | **Date and Season** | |
| **Interviewee Name** | | **Interviewer Name** | |
| **Position in H/H** | | **No. living in H/H** | |

**1. Household Composition**

**a) Please provide the following information about the all members of your compound.**

| Number | H/H Member | H/H Head? (show with X) | Gender (M=1; F=2) | Age (approx.) |
|---|---|---|---|---|
| 1 | Respondent | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |

**b) Total number of rooms in the household? _____ (number)**

**2. Household Construction**

**a) Indicate the type of construction of the compound (show with X) and whether it applies to all rooms.**

| | Number of rooms | | Number of rooms |
|---|---|---|---|
| Mud Walls | | Thatch Roof | |
| Brick and Cement Walls | | Zinc Roof | |
| Other (specify) | | | |

**b) Principal type of construction of household? (use above categories)**

_____

**3. Amount of cultivable land under household control *(amount and units)***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Owned and cultivated | | Leased and cultivated | | Share Cropped | | Owned and uncultivated | |

**4. Crops grown by Household and amounts produced and sold in the previous season**

| Crop | Acres Grown | Amount produced | Amount Sold |
|---|---|---|---|
| Maize | | | |
| Yam | | | |
| Beans | | | |
| Rice | | | |
| Guinea Corn | | | |
| Millet | | | |
| Kasava | | | |
| Groundnuts | | | |
| Other (specify) | | | |

**5. Main occupations (indicate number of males and females in each category)**

| | Males | Females | | Males | Females |
|---|---|---|---|---|---|
| 1. Farming | | | 8. Domestic Servant | | |
| 2. Agricultural Labour | | | 9. Transport operator | | |
| 3. Construction | | | 10.Government employee | | |
| 4. Fishing | | | 11.Temporary employment | | |
| 5. Trading | | | 12.Firewood/Charcoal | | |
| 6. Trading (seasonal) | | | 13. Artisan/tailoring etc. | | |
| 7. Teaching | | | 14. Gathering activities | | |
| Other (Specify) | | | | | |

**6. Household Livestock**

| | Number | | Number |
|---|---|---|---|
| 1. Cattle | | 5. Fowls | |
| 2. Sheep | | 6. Pigeons/doves | |
| 3. Goats | | 7. Other (specify) | |
| 4. Guinea Fowls | | 8. Other (specify) | |

**7. Means of transport owned by household members**

| | Number | | Number |
|---|---|---|---|
| 1. Truck/Bus | | 6. Bullock-cart | |
| 2. Car | | 7. Donkey-cart | |
| 3. Motorbike | | 8. Bicycle | |
| 4. Power Tiller | | 9. Bicycle-trailer | |
| 5. Boat | | 10. Tractor | |
| Other (specify) | | | |

**8. Estimated households cash income and expenditure in last 12 months**

| Income Source | Amount (Currency) | Expenditure | Amount (Currency) |
|---|---|---|---|
| 1. Sale of Agric. Produce | | 1. Food and drink | |
| 2. Sale of Livestock | | 2. Clothing | |
| 3. Sale of fish | | 3. Education | |
| 4. Other trading | | 4. Health | |
| 5. Agricultural labour | | 5. H/hold and kitchen utensils | |
| 6. Other Casual labour | | 6. Fuel/energy | |
| 7. Remittances from family | | 7. Rent/taxes/loans | |
| 8. Providing transport | | 8. Building | |
| 9. Charcoal/firewood | | 9. Purchase of livestock | |
| 10. Gathering activities | | 10. Transport | |
| 11. Artisan activities | | 11. Maintenance of transport | |
| Other (explain) | | 12. Agricultural inputs | |
| | | 13. Labour | |
| | | Other | |
| | | | |
| **Total (Currency)** | | **Total (Currency)** | |

**THE VALUE OF TRAVEL TIME SAVINGS: THE AFRICAN STUDIES**
**SAMPLE TANZANIA STATED PREFERENCE QUESTIONNAIRE (X TO Y)**

| | | | |
|---|---|---|---|
| **Interviewers Name:** | | **Date:** | dd/mm/2004 |
| **Journey Day** | Market/Non-Market | **Interview Time:** | |
| **Administered with the help of visual aids?** | | | Yes/No |

**Travelling alone?** Yes/No
**Who was paying the fare?** Traveller/Companion
**Type of trip:** Home-based/non-home-based
**Direction of travel:** to destination/from destination

## 1.0 Traveller's basic information

**1.1 Sex:** M/F/CM/CF

**1.2 Age: …….** yrs

**1.3 Occupation:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | Farming | | 7 | Teaching | | 13 | Firewood charcoal production | |
| 2 | Agricultural labour | | 8 | Domestic servant | | 14 | Artisan/tailoring | |
| 3 | Construction labour | | 9 | Transport operator | | 15 | Student | |
| 4 | Fishing | | 10 | Govt. employee | | 16 | Housewife | |
| 5 | Trading | | 11 | Permanent employment | | 17 | Unemployed/ Retired | |
| 6 | Petty or seasonal trading | | 12 | Temporary Employment | | 18 | Other (Pl. specify) | |

**1.4 Wearing a watch?** Yes/No **1.5 Is it a working watch?** Yes/No

## 2.0 Traveller's Household & Other Socio-economic Information

**2.1 Cultivable Land:** Amount Own and leased land: _____ acres

**2.2 Family Size (nos.)**

| | | | | | |
|---|---|---|---|---|---|
| 1. Children upto16 | | 2. Adult over 16 | | 3. Retired | |

**2.3 No of Children in Primary School** _____ No.
**2.4 No of children in Secondary School** _____ No.
**2.5 Sex of Household Head:** Male/Female
**2.6 Types of rooms in the household and their number:**

| | |
|---|---|
| 1. Mud walls with thatched roof | |
| 2. Mud wall with CI Sheet roof | |
| 3. Brick and cement walls with CI Sheet roof | |
| 4. Brick and cement walls with tiled roof | |
| 5. Other (pl. specify) …….. | |

**2.7 No of Rooms:** _____ Nos

**2.8 No of Household member engaged in gainful income earning activities:** _____ Nos

**2.9 Households Year Round Ability to Meet Food Requirements:** chronic deficit/ occasional deficit/break-even/ surplus

**2.10 Occupation of the main income earner(s) in the household:** _____

**2.11 Ownership of transport mode with numbers:** _____

**2.12 Number of cattle:** _____ nos.

**2.13 Number of goats/sheep/pigs** _____nos.

## 3.0 Traveller's Journey Related Information

### 3.1 Journey Purpose:

| | Purpose | Primary | Secondary | Tertiary |
|---|---|---|---|---|
| | **1. Travel to satisfy basic needs** | | | |
| 1a | Basic household activities: water collection, firewood collection, grinding mills, | | | |
| 1b | Basic Agricultural activities: ploughing, planting, weeding, harvesting etc. | | | |
| | **2. Travel to satisfy wider socio-economic needs** | | | |
| 2a | Wider agricultural activities: to buy farm inputs, to sell farm produce. | | | |
| 2b | Business activities: to trade (buying/selling goods for profit) | | | |
| 2c | Health facilities: health posts, local clinics, hospitals | | | |
| 2d | Educational facilities: primary schools, secondary schools, colleges and tertiary educational institutions | | | |
| 2e | Markets related travel | | | |
| 2f | Other facilities and services: town/administrative centres, government offices, post office etc. | | | |
| 2g | Economic facilities: e.g. like banks, credit institutions | | | |
| 2h | Commuting : to go to work (any type) | | | |
| 2i | Work related: while working for other employer | | | |
| 2j | Work related: self employed | | | |
| 2k | Other to satisfy wider socio-economic needs | | | |
| | **Travel to satisfy social & recreational needs** | | | |
| 3a | Weddings | | | |
| 3b | Funerals | | | |
| 3c | Visiting friends | | | |
| 3d | Visiting Relatives | | | |
| 3e | Place of worship | | | |
| 3f | Leisure activities (cinema, theatres, clubs etc.) | | | |
| 3g | Sports activities | | | |
| 3h | Other social and recreational | | | |

**3.2 Load type (Please write): _____**

**3.3 Load amount (to the nearest): _____** Kg

**3.4 Approximate value of the load: _____** TZS

**4.0 Stated Mode Choice by the Traveller (SP- X)**

| | Option 1 (Mode X) | | | Choice | Option 2 (Mode X) | | | Choice |
|---|---|---|---|---|---|---|---|---|
| | Var. 1 | Var. 2 | Var. 3 | | Var. 1 | Var. 2 | Var. 3 | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |

Safe travelling time from X to Y _____min

**THE VALUE OF TIME: THE AFRICAN STUDIES**
**SAMPLE REVEALED PREFERENCE QUESTIONNAIRE**

| | | | |
|---|---|---|---|
| **Interviewers Name:** | | **Date:** | dd/mm/2004 |
| **Journey Day** | Market/Non-Market | **Interview Time:** | |
| **Administered with the help of visual aids?** | | | Yes/No |

**Travelling alone?** Yes/No
**Who was paying the fare?** Traveller/Companion
**Type of trip:** Home-based/non-home-based
**Direction of travel:** to destination/from destination

## 1.0 Traveller's basic information

**1.1 Sex:** M/F/CM/CF

**1.2 Age: …….** yrs

**1.3 Occupation:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | Farming | | 7 | Teaching | | 13 | Firewood charcoal production | |
| 2 | Agricultural labour | | 8 | Domestic servant | | 14 | Artisan/tailoring | |
| 3 | Construction labour | | 9 | Transport operator | | 15 | Student | |
| 4 | Fishing | | 10 | Govt. employee | | 16 | Housewife | |
| 5 | Trading | | 11 | Permanent employment | | 17 | Unemployed/ Retired | |
| 6 | Petty or seasonal trading | | 12 | Temporary Employment | | 18 | Other (Pl. specify) | |

**1.4 Wearing a watch?** Yes/No **1.5 Is it a working watch?** Yes/No

## 2.0 Traveller's Household & Other Socio-economic Information

**2.1 Cultivable Land:**
Amount Own and leased land: _____ acres

**2.14 Family Size (nos.)**

| | | | | | |
|---|---|---|---|---|---|
| 1. Children upto16 | | 2. Adult over 16 | | 3. Retired | |

**2.15 Sex of Household Head:** Male/Female
**2.16 Types of rooms in the household and their number:**

| | |
|---|---|
| 1. Mud walls with thatched roof | |
| 2. Mud wall with zinc roof | |
| 3. Brick and cement walls with zinc roof | |
| 4. Brick and cement walls with concrete roof | |
| 5. Other (pl. specify) …….. | |

**2.17 No of Rooms:** _____ Nos

**2.18 No of Household member engaged in gainful income earning activities: _____** Nos

**2.19 Occupation of the main income earner(s) in the household: _____**

**2.20 Ownership of transport mode with numbers: _____**

**2.21 Number of cattle: _____** nos.

**2.22 Number of goats/sheep _____**nos.

## 3.0 Traveller's Journey Related Information

### 3.1 Journey Purpose:

| | Purpose | Primary | Secondary | Tertiary |
|---|---|---|---|---|
| | **1. Travel to satisfy basic needs** | | | |
| 1a | Basic household activities: water collection, firewood collection, grinding mills, | | | |
| 1b | Basic Agricultural activities: ploughing, planting, weeding, harvesting etc. | | | |
| | **2. Travel to satisfy wider socio-economic needs** | | | |
| 2a | Wider agricultural activities: to buy farm inputs, to sell farm produce farm. | | | |
| 2b | Business activities: to trade (buying/selling goods for profit) | | | |
| 2c | Health facilities: health posts, local clinics, hospitals | | | |
| 2d | Educational facilities: primary schools, secondary schools, colleges and tertiary educational institutions | | | |
| 2e | Markets related travel | | | |
| 2f | Other facilities and services: town/administrative centres, government offices, post office etc. | | | |
| 2g | Economic facilities: e.g. like banks, credit institutions | | | |
| 2h | Commuting : to go to work (any type) | | | |
| 2i | Work related: while working for other employer | | | |
| 2j | Work related: self employed | | | |
| 2k | Other to satisfy wider socio-economic needs | | | |
| | **Travel to satisfy social & recreational needs** | | | |
| 3a | Weddings | | | |
| 3b | Funerals | | | |
| 3c | Visiting friends | | | |
| 3d | Visiting Relatives | | | |
| 3e | Place of worship | | | |
| 3f | Leisure activities (cinema, theatres, clubs etc.) | | | |
| 3g | Sports activities | | | |
| 3h | Other social and recreational | | | |

### 3.2 Load type (Please write): _____

**3.3 Load amount (to the nearest): _____** Kg

**3.3 Approximate value of the load: _____** Currency

**3.4 Journey Distance (approx) _____** km

## 4.0 Traveller's Real Mode Choice Related Information (Information for a one-way trip only)

| | **Option used** | | | **Options Rejected** | | |
|---|---|---|---|---|---|---|
| | Mammy Wagon | Trotro | Bicycle | Mammy Wagon | Trotro | Bicycle |
| Fare - **main mode** (Cedi) | | | | | | |
| Fare - **access mode** (Cedi) | | | | | | |
| Fare load - **main mode** (Cedi) | | | | | | |
| Fare load - **access mode** (Cedi) | | | | | | |
| Waiting Time - **main mode** (min) | | | | | | |
| Waiting time- **access mode** (min) | | | | | | |
| In-vehicle time - **main mode** (min) | | | | | | |
| In-vehicle time - **access mode** (min) | | | | | | |
| Comfort [*] | | | | | | |
| Safety [**] | | | | | | |
| Walking time (min) | | | | | | |

Note: [*] – tick [✓] if comfortable; cross [x] if uncomfortable
[**] – tick [✓] if safe; [x] if unsafe

## THE VALUE OF TRAVEL TIME SAVINGS: THE AFRICAN STUDIES
## SAMPLE TRAVEL PURPOSE SURVEY QUESTIONNAIRE

Name of the Road: Road Type: Date: / /

Season: Dry/Wet Day: Market/Non-Market

| Time | M/F/ CM/CF[27] | Mode | Occupation | Trip Purposes | | | Any other purpose (Y/N) | Wearing a watch?[28] (✓ or X) |
|---|---|---|---|---|---|---|---|---|
| | | | | Primary | Secondary | Tertiary | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[27] M= Male; F=Female; CM= Male Child (Below 16 years); CF = Female Child (Below 16 years)

[28] If the interviewee wears a non-working watch then put an asterisk (*) after the tick mark

# Focus Group Discussions Notes (Tanzania)

## Schedule from Focus Groups and interviews

| Date | Location | Activity |
|---|---|---|
| Tuesday 7th | Kisange Sangeni and Himo | Interview on visual aid interviews |
| Wed 8th | Umbwe | Interview on visual aid interviews |
| Thur 9th | Umbwe | Organisation meeting with Village Chairman. Interview on visual aids |
| Fri 10th | Umbwe | Interviews on visual aids |
| Sat 11th | Kiboroloni | Market interviews |
| Sun 12th | | Rest Day |
| Mon 13th | Kisange Sangeni / Himo | Focus Group, Market Interviews |
| Tue 14th | Umbwe | Male/female focus groups |
| Wed 15th | | |
| Thurs 16th | Himo | Market interviews if needed. |

## Brief description of Methods used.

| **Focus group aim** | **Techniques used and types of group.** | **Checklist** |
|---|---|---|
| Preliminary road data. To have background data for the design of SP and RP questionnaires. | Semi structured interview Village Chairman and Secretary and others. Validation with district Engineer | Names, ages, location, positions. See preliminary road data sheet. |
| Perception of time and daily activity. To have better understanding of perceptions and methods of measuring of time to inform enumerators on how to ask about time as well as representation on the visual aids used in the SP. Secondly to inform the results interpretation on time budgeting from daily activity data. | Semi-structured discussion. Daily Routine map. Two Male and two female groups from a mixture of backgrounds. | Introductions<br>Do an average daily activity chart for the group. Ask what tasks take what time and how they are measured.<br>Investigate other methods of measuring time in the community.<br>Specifically ask about watches and radios if not mentioned, as well as ability to read time.<br>Differences between men, women and different age groups.<br>Differences between the seasons |
| Community Travel and Transport. To give context to the SP and RP design in the types of trips people | Area mapping<br>Transport discussion<br>Two female and two male groups from a mixture of | Introductions.<br>Map – main geog features, towns/villages, roads, water points, health points, |

| | | |
|---|---|---|
| make and the reasons why. | backgrounds. | etc.<br>Transport – modes of transport used, times, distance, fares, frequency, rich/poor people differences. |
| Wealth and poverty. To validate and given context to results from household survey and indicators used in SP and RP questionnaires. | Wealth ranking<br>Two mixed groups from different backgrounds | Introductions<br>List indicators of wealth and poverty in the community.<br>Disaggregate indicators and attach 'numbers of' for different wealth groups in community.<br>Ask about chronic food shortage specifically. |

**Individual interviews for results validation**

| **Interview investigating and aim** | **Techniques used and type of people.** | **Checklist** |
|---|---|---|
| Visual Aid. To investigate interviewees reaction to the visual aid | Semi Structured interview using visual aid or questionnaire. Good mixture of people. | Introduction<br>Show either the paper questionnaire or the visual aid and go through the journey choices. Or ask straight after someone has been interviewed.<br>Was answering the questions easy or difficult? Why?<br>Show the other way of presenting the questions, get response.<br>Improvements on visual aid. |
| Non-willingness to pay on market day and load not significant. To investigate the non-significance of the market day variable | Semi Structured interview. Good mixture of traders and customers in market. | Introduction<br>Ask about their journey to the market.<br>Ask if they would be willing to pay more (something if walking) for the journey if it was quicker.<br>Why?<br>Would they pay more for the same journey on a non-market day?<br>Why? |

**Focus Groups for results validation**

| **Interview investigating and aim** | **Techniques used and type of people.** | **Checklist** |
|---|---|---|
| Poor and essential travel. To investigate the significance of the poor's | Discussion facilitated by matrix.<br>One male and one female | Introductions<br>List out the different journeys people make. |

| | | |
|---|---|---|
| willingness to pay less. Secondly to look at the significance of essential travel. | group from different backgrounds. | Discuss the range of options and fares for these.<br>Discuss under what situation people would be willing to pay more.<br>Discuss how this willingness varies if you are rich or poor. |
| Female/male differences in values. To investigate the reasons behind the different travel time saving values for men and women | Discussion facilitated by matrix.<br>One male and one female group from different backgrounds. | Introductions<br>List of different decisions in the house hold that involve money. Attribute rough value.<br>Discuss on matrix who in the household makes the decision.<br>Discussion on categories of expenditure or threshold levels. |

## Types of Questionnaire Surveys in Ghana & Tanzania

**Ghana**

| Questionnaire | Application Unit (Place of Administration) | Collected Data on | Objectives |
|---|---|---|---|
| Household Questionnaire | Household (at the household) | Basic household information, income and expenditure data, and activity data | To identify variables significantly explains the household expenditure. These variables are used in preference questionnaires for estimating household expenditure that are subsequently used for poverty analysis. |
| Revealed Preference | Individual traveller (roadside) | Basic personal and household information, travel attributes and revealed choice data | To estimate walking and IVT saving values for passengers of all modes. |
| SP 1 | Individual traveller (roadside) | Basic personal and household information, travel attributes and stated choice data | To estimate IVT saving values for minibus passengers. Also to value other travel attributes including comfort of travel. |
| SP 2 | Individual traveller (roadside) | As above | To estimate walking and IVT saving values for minibus passengers. Also to value other travel attributes. |
| SP 3 | Individual traveller (roadside) | As above | To estimate IVT saving values for minibus & Mammy Wagon passengers. Also to value other travel attributes. |
| SP 4 | Individual traveller (roadside) | As above | To estimate IVT saving values for bicycle & Mammy Wagon passengers. Also to value other travel attributes. |
| SP 5 | Individual traveller (roadside) | As above | To estimate walking and IVT saving values for Mammy Wagon passengers. Also to value other travel attributes. |
| SP 6 | Individual traveller (roadside) | As above | To estimate IVT saving values for bicycle & Mammy Wagon passengers. Also to value other travel attributes. |
| Travel Purpose Questionnaire | Individual traveller (roadside) | Travel attributes including travel purpose | To supplement travel purpose data already collected as a part of the preference data in order to understand the purpose of travel by the respondents. |

**Tanzania**

| Questionnaire | Application Unit (Place of Administration) | Collected Data on | Objectives |
|---|---|---|---|
| Household Questionnaire | Household (at the household) | Basic household information, income and expenditure data, and activity data | To identify variables significantly explains the household expenditure. These variables are used in preference questionnaires for estimating household expenditure that are subsequently used for poverty analysis. Evidence from the activity diaries is used for analysis of time-use patterns of different social and gender groups. |
| Revealed Preference | Individual traveller (roadside) | Basic personal and household information, travel attributes and revealed choice data | To estimate walking and IVT saving values for passengers of all modes. |
| SP 1 | Individual traveller (roadside) | Basic personal and household information, travel attributes and stated choice data | To estimate IVT saving values for minibus passengers. Also to value other travel attributes including comfort of travel. |
| SP 2 | Individual traveller (roadside) | As above | To estimate walking and IVT saving values for minibus passengers. Also to value other travel attributes including comfort of travel. |
| SP 3 | Individual traveller (roadside) | As above | To estimate IVT saving values for bicycle passengers. Also to value other travel attributes including comfort of travel. |
| SP 4 | Individual traveller (roadside) | As above | To estimate IVT saving values for minibus passengers. Also to value other travel attributes including comfort of travel. |
| SP 5 | Individual traveller (roadside) | As above | To estimate walking and IVT saving values for minibus passengers. Also to value other travel attributes including comfort of travel. |
| Travel Purpose Questionnaire | Individual traveller (roadside) | Travel attributes including travel purpose | To supplement travel purpose data already collected as a part of the preference data in order to understand the purpose of travel by the respondents. |

## Alternatives, Choice Options and Values of the Variables in the Stated Preference (SP) Experiments

**Ghana**

### Ghana SP Questionnaire 1 (minibus vs. minibus on improved bituminous road): Round 1&2

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (Cedi) | Time (min) | Comfort | Cost (Cedi) | Time (min) | Comfort |
| 1 | 5,000 | 120 | uncomf. | 7,500 | 60 | comfortable |
| 2 | 6,000 | 105 | uncomf. | 8,500 | 60 | comfortable |
| 3 | 7,000 | 120 | uncomf. | 9,500 | 90 | ucomf. |
| 4 | 5,000 | 120 | uncomf. | 8,500 | 60 | uncomf. |
| 5 | 6,000 | 105 | uncomf. | 9,500 | 60 | comfortable |
| 6 | 7,000 | 90 | uncomf. | 10,500 | 60 | comfortable |
| 7 | 5,000 | 120 | uncomf. | 9,500 | 60 | comfortable |
| 8 | 6,000 | 105 | uncomf. | 10,500 | 60 | uncomf. |
| 9 | 8,000 | 120 | uncomf. | 12,500 | 90 | comfortable |

### Ghana SP Questionnaire 2 (minibus vs. minibus with walking time on improved bituminous road): Round 1&2

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (Cedi) | Time (min) | Walk (min) | Cost (Cedi) | Time (min) | Walk (min) |
| 1 | 6,000 | 120 | 60 | 7,500 | 75 | 15 |
| 2 | 7,000 | 105 | 30 | 8,500 | 90 | 0 |
| 3 | 8,000 | 90 | 45 | 9,500 | 60 | 30 |
| 4 | 6,000 | 105 | 45 | 9,000 | 75 | 0 |
| 5 | 6,000 | 120 | 60 | 9,000 | 75 | 30 |
| 6 | 8,000 | 90 | 30 | 11,000 | 75 | 15 |
| 7 | 7,000 | 120 | 60 | 11,000 | 105 | 15 |
| 8 | 7,000 | 120 | 30 | 11,000 | 90 | 0 |
| 9 | 8,000 | 90 | 45 | 12,000 | 45 | 30 |

**Ghana SP Questionnaire 3 (Mammy Wagon vs. Minibus) on improved gravel road): Round 1&2**

| Alt. | Mammy Wagon | | Minibus | |
|---|---|---|---|---|
| | Cost (Cedi) | Time (min) | Cost (Cedi) | Time (min) |
| 1 | 3,000 | 90 | 4,000 | 15 |
| 2 | 2,500 | 60 | 3,500 | 45 |
| 3 | 2,000 | 45 | 3,000 | 30 |
| 4 | 2,000 | 90 | 3,500 | 30 |
| 5 | 2,500 | 60 | 4,000 | 15 |
| 6 | 3,000 | 45 | 4,500 | 45 |
| 7 | 2,000 | 90 | 5,000 | 45 |
| 8 | 3,000 | 60 | 6,000 | 30 |
| 9 | 2,500 | 45 | 5,500 | 15 |

**Ghana SP Questionnaire 4 (Bicycle vs. Mammy Wagon) on improved gravel road): Round 1&2**

| Alt. | Bicycle | | Mammy Wagon | |
|---|---|---|---|---|
| | Cost (Cedi) | Time (min) | Cost (Cedi) | Time (min) |
| 1 | 1,000 | 90 | 4,000 | 75 |
| 2 | 1,500 | 150 | 4,500 | 60 |
| 3 | 1,000 | 120 | 4,000 | 45 |
| 4 | 1,500 | 120 | 3,000 | 75 |
| 5 | 2,000 | 90 | 3,500 | 60 |
| 6 | 1,500 | 150 | 3,000 | 45 |
| 7 | 2,000 | 150 | 3,000 | 75 |
| 8 | 1,500 | 120 | 2,500 | 60 |
| 9 | 2,000 | 90 | 3,000 | 45 |

**Ghana SP Questionnaire 5 (Mammy Wagon vs. Mammy Wagon with walking time on poor gravel road): Round 1&2**

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (Cedi) | Time (min) | Walk (min) | Cost (Cedi) | Time (min) | Walk (min) |
| 1 | 3,000 | 120 | 45 | 4,000 | 75 | 0 |
| 2 | 4,000 | 90 | 40 | 5,000 | 75 | 10 |
| 3 | 5,000 | 60 | 30 | 6,000 | 30 | 15 |
| 4 | 4,000 | 90 | 60 | 6,000 | 60 | 15 |
| 5 | 5,000 | 90 | 45 | 7,000 | 45 | 15 |
| 6 | 6,000 | 60 | 60 | 8,000 | 45 | 45 |
| 7 | 5,000 | 60 | 60 | 8,500 | 45 | 15 |
| 8 | 4,000 | 90 | 45 | 7,500 | 60 | 15 |
| 9 | 5,000 | 90 | 15 | 8,500 | 45 | 0 |

**Ghana SP Questionnaire 6 (Bicycle vs. Mammy Wagon) poor gravel road): Round 1&2**

| Alt. | Bicycle | | Mammy Wagon | |
|---|---|---|---|---|
| | Cost (Cedi) | Time (min) | Cost (Cedi) | Time (min) |
| 1 | 2,000 | 90 | 4,500 | 75 |
| 2 | 1,500 | 150 | 4,000 | 60 |
| 3 | 2,000 | 120 | 4,500 | 45 |
| 4 | 1,500 | 120 | 3,500 | 75 |
| 5 | 2,000 | 90 | 4,000 | 60 |
| 6 | 1,500 | 150 | 3,500 | 45 |
| 7 | 2,000 | 150 | 3,000 | 75 |
| 8 | 1,500 | 120 | 2,500 | 60 |
| 9 | 2,000 | 90 | 3,000 | 45 |

**Tanzania**

## SP Questionnaire 1 (minibus vs. minibus on improved bituminous road): Round 1

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Comfort | Cost TZS) | Time (min) | Comfort |
| 1 | 400 | 90 | uncomf. | 600 | 45 | comfortable |
| 2 | 500 | 75 | uncomf. | 700 | 45 | comfortable |
| 3 | 400 | 90 | uncomf. | 600 | 70 | Ucomf. |
| 4 | 500 | 75 | uncomf. | 800 | 30 | uncomf. |
| 5 | 600 | 60 | uncomf. | 900 | 30 | comfortable |
| 6 | 600 | 50 | uncomf. | 900 | 30 | comfortable |
| 7 | 500 | 90 | uncomf. | 900 | 45 | comfortable |
| 8 | 600 | 60 | uncomf. | 1,000 | 30 | uncomf. |
| 9 | 500 | 60 | uncomf. | 900 | 40 | comfortable |

## SP Questionnaire 1 (minibus vs. minibus on improved bituminous road): Round 2

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Comfort | Cost (TZS) | Time (min) | Comfort |
| 1 | 400 | 90 | uncomf. | 600 | 45 | comfortable |
| 2 | 500 | 75 | uncomf. | 700 | 45 | comfortable |
| 3 | 400 | 90 | uncomf. | 600 | 70 | uncomf. |
| 4 | 500 | 75 | uncomf. | 750 | 30 | uncomf. |
| 5 | 600 | 60 | uncomf. | 850 | 30 | comfortable |
| 6 | 600 | 50 | uncomf. | 850 | 30 | comfortable |
| 7 | 500 | 90 | uncomf. | 800 | 45 | comfortable |
| 8 | 600 | 60 | uncomf. | 900 | 30 | uncomf. |
| 9 | 500 | 60 | uncomf. | 800 | 40 | comfortable |

## SP Questionnaire 2 (minibus vs. minibus with walking time on improved bituminous road): Round 1

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Walk (min) | Cost2 (TZS) | Time2 (min) | Walking 2 (min) |
| 1 | 500 | 60 | 60 | 600 | 30 | 15 |
| 2 | 600 | 45 | 30 | 700 | 35 | 15 |
| 3 | 500 | 60 | 40 | 600 | 45 | 30 |
| 4 | 600 | 45 | 45 | 850 | 30 | 0 |
| 5 | 500 | 60 | 60 | 750 | 30 | 45 |
| 6 | 600 | 50 | 30 | 850 | 40 | 20 |
| 7 | 500 | 40 | 60 | 1000 | 30 | 15 |
| 8 | 700 | 45 | 30 | 1200 | 30 | 15 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | 500 | 60 | 45 | 1000 | 30 | 35 |

**SP Questionnaire 2 (minibus vs. minibus with walking time on improved bituminous road): Round 2**

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Walk (min) | Cost (TZS) | Time (min) | Walk (min) |
| 1 | 500 | 60 | 60 | 600 | 30 | 15 |
| 2 | 600 | 45 | 30 | 700 | 35 | 15 |
| 3 | 500 | 60 | 40 | 600 | 40 | 30 |
| 4 | 600 | 45 | 45 | 800 | 25 | 0 |
| 5 | 500 | 60 | 60 | 700 | 30 | 45 |
| 6 | 600 | 50 | 30 | 800 | 40 | 20 |
| 7 | 500 | 40 | 60 | 850 | 30 | 15 |
| 8 | 700 | 45 | 30 | 1050 | 25 | 15 |
| 9 | 500 | 60 | 45 | 850 | 30 | 35 |

**SP Questionnaire 3 (bicycle vs. bicycle with walking time on poor earth road): Round 1**

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Walk (min) | Cost (TZS) | Time (min) | Walk (min) |
| 1 | 500 | 90 | 45 | 600 | 45 | 15 |
| 2 | 600 | 75 | 30 | 700 | 60 | 10 |
| 3 | 700 | 60 | 30 | 800 | 40 | 15 |
| 4 | 700 | 60 | 45 | 1000 | 40 | 15 |
| 5 | 600 | 90 | 40 | 900 | 45 | 20 |
| 6 | 600 | 75 | 30 | 900 | 60 | 15 |
| 7 | 500 | 60 | 45 | 1100 | 45 | 15 |
| 8 | 500 | 60 | 30 | 1100 | 40 | 10 |
| 9 | 400 | 90 | 30 | 1000 | 45 | 15 |

**SP Questionnaire 3 (bicycle vs. bicycle with walking time on poor earth road): Round 2**

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Walk (min) | Cost (TZS) | Time (min) | Walk (min) |
| 1 | 500 | 90 | 45 | 600 | 45 | 15 |
| 2 | 600 | 75 | 30 | 700 | 60 | 10 |
| 3 | 700 | 60 | 30 | 800 | 40 | 15 |
| 4 | 700 | 60 | 45 | 950 | 40 | 15 |
| 5 | 600 | 90 | 40 | 850 | 45 | 20 |
| 6 | 600 | 75 | 30 | 850 | 60 | 15 |
| 7 | 500 | 60 | 45 | 850 | 45 | 15 |
| 8 | 500 | 60 | 30 | 850 | 40 | 10 |
| 9 | 400 | 90 | 30 | 750 | 45 | 15 |

**SP Questionnaire 4 (minibus vs. minibus on fair/poor gravel road): Round 1**

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Comfort | Cost TZS) | Time (min) | Comfort |
| 1 | 400 | 90 | uncomf. | 600 | 45 | comfortable |
| 2 | 500 | 75 | uncomf. | 700 | 55 | comfortable |
| 3 | 400 | 90 | uncomf. | 600 | 75 | uncomf. |
| 4 | 500 | 75 | uncomf. | 750 | 30 | uncomf. |
| 5 | 600 | 60 | uncomf. | 850 | 40 | comfortable |
| 6 | 600 | 50 | uncomf. | 850 | 35 | comfortable |
| 7 | 500 | 90 | uncomf. | 800 | 45 | comfortable |
| 8 | 600 | 60 | uncomf. | 900 | 40 | uncomf. |
| 9 | 500 | 60 | uncomf. | 800 | 45 | comfortable |

**SP Questionnaire 4 (minibus vs. minibus on fair/poor gravel road): Round 2**

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Comfort | Cost TZS) | Time (min) | Comfort |
| 1 | 400 | 90 | uncomf. | 550 | 45 | comfortable |
| 2 | 500 | 75 | uncomf. | 650 | 45 | comfortable |
| 3 | 400 | 90 | uncomf. | 550 | 70 | uncomf. |
| 4 | 500 | 75 | uncomf. | 750 | 30 | uncomf. |
| 5 | 600 | 60 | uncomf. | 850 | 30 | comfortable |
| 6 | 600 | 50 | uncomf. | 850 | 30 | comfortable |
| 7 | 500 | 90 | uncomf. | 800 | 45 | comfortable |
| 8 | 600 | 60 | uncomf. | 900 | 30 | uncomf. |
| 9 | 500 | 60 | uncomf. | 800 | 40 | comfortable |

**SP Questionnaire 5 (minibus vs. minibus with walking time on fair/poor gravel road): Round 1**

| Alt. | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Walk (min) | Cost (TZS) | Time (min) | Walk (min) |
| 1 | 600 | 60 | 60 | 700 | 30 | 30 |
| 2 | 700 | 50 | 40 | 800 | 40 | 25 |
| 3 | 600 | 60 | 20 | 700 | 45 | 10 |
| 4 | 500 | 60 | 60 | 800 | 45 | 30 |
| 5 | 600 | 60 | 45 | 900 | 30 | 30 |
| 6 | 500 | 50 | 60 | 800 | 40 | 50 |
| 7 | 600 | 60 | 60 | 1000 | 50 | 30 |
| 8 | 500 | 45 | 45 | 900 | 30 | 30 |
| 9 | 600 | 60 | 20 | 1000 | 30 | 10 |

**SP Questionnaire 2 (minibus vs. minibus with walking time on fair/poor gravel road): Round 2**

| **Alt.** | Option 1 | | | Option 2 | | |
|---|---|---|---|---|---|---|
| | Cost (TZS) | Time (min) | Walk (min) | Cost (TZS) | Time (min) | Walk (min) |
| 1 | 600 | 60 | 60 | 700 | 30 | 30 |
| 2 | 700 | 50 | 40 | 800 | 40 | 25 |
| 3 | 600 | 60 | 20 | 700 | 45 | 10 |
| 4 | 500 | 60 | 60 | 650 | 45 | 30 |
| 5 | 600 | 60 | 45 | 750 | 30 | 30 |
| 6 | 500 | 50 | 60 | 650 | 40 | 50 |
| 7 | 600 | 60 | 60 | 950 | 50 | 30 |
| 8 | 500 | 45 | 45 | 850 | 30 | 30 |
| 9 | 600 | 60 | 20 | 950 | 30 | 10 |

Appendix X

## Sample of Visual-Aid Cards Used in Ghana

**OPTION 1**

| Fare | Time | Walking Time |
|---|---|---|
| **6000**  | 120 Minutes  | 60 Minutes  |

**OPTION 2**

| Fare | Time | Walking Time |
|---|---|---|
| **7500**  | 75 Minutes  | 15 Minutes  |

**Final Tree Structures**

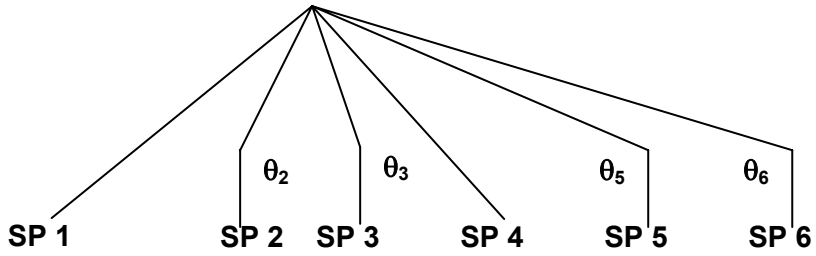



Figure XI-1 Final tree structure Ghana (combined SP analysis) of the hierarchical logit

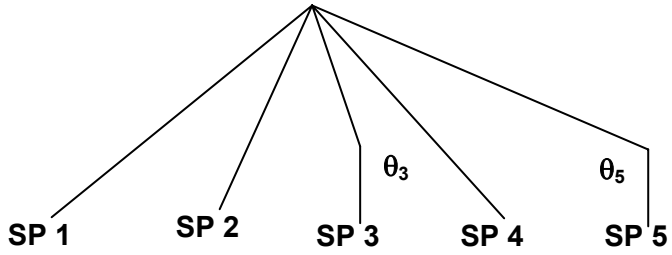



Figure XI-2: Final tree structure Tanzania (combined SP analysis) of the hierarchical logit

## Model Estimation Results

| | Ghana | | | Tanzania | | |
|---|---|---|---|---|---|---|
| **Coefficients** | **Type of variable** | **Dummy value applied to** | **Coefficients** | **Type of variable** | **Dummy value applied to** | **Coefficients** |
| ASC-Minibus | Dummy | N/A | .7503 (9.8) | Dummy | N/A | N/A |
| ASC-MW | Dummy | N/A | .5842 (4.1) | Dummy | N/A | N/A |
| Cost | Continuous | N/A | -.7990E-03 (-20.7) | Continuous | N/A | -.4733E-02 (-20.9) |
| IVT | Continuous | N/A | -.2028E-01 (-13.3) | N/A | N/A | -4.07E-03 (-3.7) |
| Walk | Continuous | N/A | -.3705E-01 (-13.2) | N/A | N/A | -4.64E-03 (-3.6) |
| IVT+Walk | N/A | N/A | N/A | Continuous | N/A | -.1742E-01 (-16.1) |
| Uncomfortable travel | Dummy | Time | -.1848E-01 (-15.5) | Dummy | Time | -.8658E-02 (-13.1) |
| Market day travel | Dummy | Time | N/S (N/A) | Dummy | Time | N/S (N/A) |
| Safe travel condition | Not used | | | Dummy | Time | N/S (N/A) |
| Male travellers | Dummy | Cost | .9620E-04 (3.9) | Dummy | Cost | .8014E-03 (5.4) |
| Travellers below 16 years old | Dummy | Time | .4591E-02 (2.2) | Dummy | | .7434E-02 (4.1) |
| Use of visual-aid in SP | Dummy | Time | N/S (N/A) | Dummy | Time | N/S (N/A) |
| Social & leisure travel | Dummy | Time | N/S (N/A) | Dummy | Time | N/S (N/A) |
| Travellers with a watch | Dummy | Cost | .1162E-03 (5.3) | Dummy | Cost | .6462E-03 (4.3) |
| Travellers with a permanent job | Dummy | Time | -.2017E-01 (-4.2) | Dummy | Time | N/S (N/A) |
| Traders | Dummy | Time | N/S (N/A) | Dummy | Time | N/S (N/A) |
| Travelling with a load | Dummy | Cost | N/S (N/A) | Dummy | Cost | N/S (N/A) |
| Poor traveller | Dummy | Cost | -.1026E-03 (-6.2) | Dummy | Cost | -.2930E-02 (-13.6) |
| Travelling on poor road | Dummy | Cost | N/S (N/A) | Dummy | Cost | -.4161E-02 (-3.1) |
| Wet season travel | Dummy | Time | N/S (N/A) | Dummy | Time | N/S (N/A) |

Appendix XIII

## Ghana RP Model Statistics

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Rho-Sq. | .1819 | .2295 | .2106 |
| Rho-Sq. Const. | -.0630 | -.0012 | -.0257 |
| Cost | .3081E-05 (0.1) | -.1054E-04 (-.4) | .1680E-04 (.7) |
| IVT | **-.8164E-02** (-3.1) | .4449E-02(1.2) | **-.5056E-01** (-2.6) |
| Walk | **-.2421E-01** (-7.8) | **-.2165E-01** (-6.9) | **-.2510E-01** (-7.6) |
| Uncom_d_time | | **-.9631E-02** (-4.8) | |
| Market_d_Time | | | .1245E-01 (1.8) |
| Sex_d_T | | | .1781E-02 (.3) |
| Age_d_time | | | -.9852E-02 (-.7) |
| Direction_D_Time | | | .5617E-02 (.8) |
| Journey d time | | | .2882E-01 (1.6) |
| Purpose d time | | | .5202E-02 (.7) |
| Watch_d_time | | | -.8564E-02 (-1.4) |
| PJOB_d_time | | | .6505E-02 (1.0) |
| LOAD_d_tim | | | -.3452E-02 (-.3) |
| TRAD_d_time | | | -.1833E-01 (-.9) |
| POOR_d_time | | | .1788E-02 (.3) |
| ROAD_d_time | | | .8775E-02 (1.5) |

Note: **bold** coefficients are significant coefficients;

Appendix XIV

**Main Reasons for Unsuitability of RP**

| Study roads | Main Reasons |
|---|---|
| **Ghana** | |
| Jimli – Yendi<br>Length – 61.7 km | - Minibuses are the main mode<br>- Modes operate "when full" basis and therefore difficult to define waiting time.<br>- Hardly any difference between fares of the modes (e.g. minibuses charge Cedi 8,000 and takes about 2 hours from Jimli to Yendi, Mammy Wagons charge the same fare and take slightly longer to travel (reported to be 10-15 extra minutes);<br>- Passenger's use the mode which is available immediately given that practically there are no differences of time and fares. |
| Kulugini – Sekpe<br>Length – 21.2 km | - main mode is the minibuses;<br>- Minibuses operate only twice a day;<br>- Mammy Wagons only operate on a market day.<br>- hardly any difference between fares of the modes (e.g. minibuses charge Cedi 3,000 and takes about 30 minutes and Mammy Wagons charge 3,000 and take slightly longer time (35-40 minutes);<br>- There is hardly any mode choice option available. |
| Jimli-Chegu<br>Length - 9.0 km | - Motorised modes are not available daily (Mammy Wagons operates once on a market day; minibuses operate in wet season)<br>- Usually people walk or bike<br>- No timetable for the operation of the public transport modes. Therefore, difficult to define waiting time. |
| **Tanzania** | |
| Moshi-Himo<br>Length – 25.0 km | - main mode is the minibuses; costs TZS 600 per person<br>- minibuses operate "when full" basis and therefore difficult to define waiting time;<br>- travel time between Moshi to Himo varies between 30 to 50 minutes – depending on the number of stops made by the minibuses. Therefore, it is difficult to define the travel time;<br>- No practical alternative is available (the only alternative is the taxis that costs 50 times higher; taxis are also not available readily if one wishes to use them);<br>- Passenger's use the mode which is available immediately given that practically there is no difference in time and fares. |
| Moshi-Lyamungo Kijiweni<br>Length-15.2 km | - Minibuses are the main mode; costs TZS 600 person;<br>- Operate "when full" basis and therefore difficult to define waiting time;<br>- travel time varies between 30-45 minutes depending on the number of stops made. Therefore, it is difficult to define the travel time;<br>- No minibuses operate during the main wet season due to bad road conditions.<br>- No practical alternative is available (the only theoretical alternative is the taxis that costs 50-60 times higher; taxis are also not available readily). |
| Uchira – Kisange Sangeni<br>Length: 8.6 km | - Walking and bicycles are the main modes;<br>- No motorised transport operate on this road;<br>- There is no alternative modes to select from |

Appendix XV

## Calculations of Rural Average Wage Rates for Ghana and Tanzania

### Ghana

**Agricultural Wage rate (Cedi):**

| Month | Type of Work | Unit | required man-days | Wage | Wage per day (TZS) |
|---|---|---|---|---|---|
| Jan | Clearing of land | Day | 4 | 100,000 | 25,000 |
| Feb | Clearing of land | acre | 4 | 100,000 | 25,000 |
| Mar | Raising of mounds for yams | L.S | 1 | 10,000 | 10,000 |
| Apr | Raising of mounds for yams | L.S | 1 | 10,000 | 10,000 |
| May | Weeding of maize | L.S | 1 | 10,000 | 10,000 |
| Jun | Weeding of maize, groundnuts and yams | acre | 3.5 | 70,000 | 20,000 |
| Jul | Weeding of maize, groundnuts and yams | acre | 3.5 | 70,000 | 20,000 |
| Aug | Harvesting of maize | acre | 3.5 | 50,000 | 14,286 |
| Sep | Rice weeding | acre | 3.5 | 70,000 | 20,000 |
| Oct | Rice harvesting | acre | 3.5 | 70,000 | 20,000 |
| Nov | Harvesting of yams | acre | 3.5 | 70,000 | 20,000 |
| Dec | No activity | | | | |
| Average: Agricultural Wage rate | | | | | 17,662 |

Source: Village-level interview at Jimli

**Non-agricultural wage rate (Cedi):**
Skilled labourer (carpenter) : 60,000 per day

| | |
|---|---|
| Proportion of skilled labourer (assumed) | 5% |
| Weighted average daily wage rate (per day) | 20,279 |
| Weighted average daily wage rate (per hour) | **2,535[29] say Cedi 2,550** |

[29] Assumed that an average labourer works 8-hour a day

## Tanzania

**Agricultural Wage rate (TZS):**

| Month | Type of Work | Unit | required man-days | Wage | Wage per day |
|---|---|---|---|---|---|
| Jan | land clearing | acre | 4 | 10,000 | 2,500 |
| Feb | land clearing | acre | 4 | 10,000 | 2,500 |
| Mar | Planting of maize | acre | 2 | 6,000 | 3,000 |
| Apr | Weeding of maize | acre | 4 | 15,000 | 3,750 |
| May | Weeding of maize | acre | 4 | 15,000 | 3,750 |
| Jun | Weeding of maize | acre | 4 | 15,000 | 3,750 |
| Jul | Harvesting of maize | acre | 4 | 8,000 | 2,000 |
| Aug | Harvesting of maize | acre | 4 | 8,000 | 2,000 |
| Sep | Harvesting of beans & planting of maize | day | 1 | 3,000 | 3,000 |
| Oct | Planting of maize | day | 1 | 5,000 | 5,000 |
| Nov | Weeding of maize | acre | 4 | 10,000 | 2,500 |
| Dec | Weeding of maize | acre | 4 | 10,000 | 2,500 |
| Average: Agricultural Wage rate | | | | | **3,021** |

Source: Village-level interview at Himo

**Non-agricultural wage rate (TZS):**

| | |
|---|---|
| Skilled labourer (plumber) | 7,000 |
| Skilled labourer (carpenter) | 5,000 |
| Average: Skilled-labour | 6,000 |

Proportion of skilled labourer (assumed) 5%
Weighted average daily wage rate (per day) 3,170
Weighted average daily wage rate (per hour) **396[30] say TZS 400**

[30] Assumed that an average labourer works 8-hour a day

## Estimation of the SCFs and the SWR Factors

### Ghana: Estimation of the Standard Conversion Factor (SCF)

| | Billion Cedi | | | | | Average |
|---|---|---|---|---|---|---|
| | **2000** | **2001** | **2002** | **2003** | **2004** | |
| 1. Value of total Imports CIF | 9,864 | 14,617 | 17,191 | 22,271 | 33,470 | 19,483 |
| 2. Value of total Exports FOB | 8,789 | 12,302 | 13,260 | 20,205 | 29,422 | 16,796 |
| 3. Import and Export | 18,653 | 26,919 | 30,451 | 42,476 | 62,892 | 36,278 |
| 4. Import Duty | 798 | 1,098 | 1,446 | 2,143 | 2,591 | 1,615 |
| 5. Total Export Duty | 0 | 0 | 0 | 0 | 0 | 0 |
| SCF = row 3/[row 3 + row 4+row 5] | | | | | | **0.96** |

**Source: Customs, Excise and Preventive Service (CEPS), Ghana**

### Tanzania: Estimation of the Standard Conversion Factor (SCF)

| | TZSx1,000 | | | | |
|---|---|---|---|---|---|
| | **2000/01** | **2001/02** | **2002/03** | **2003/04** | Average |
| 1. Value of total Imports CIF | 1,419,427 | 1,617,072 | 1,873,257 | 2,619,476 | 1,882,308 |
| 2. Value of total Exports FOB | 589,422 | 758,986 | 1,007,744 | 1,263,247 | 904,850 |
| 3. Import and Export | 2,008,849 | 2,376,058 | 2,881,001 | 3,882,723 | 2,787,158 |
| 4. Import Duty | 363,541 | 462,159 | 458,286 | 561,555 | 461,385 |
| 5. Total Export Duty | 0 | 0 | 0 | 0 | 0 |
| SCF = row 3/[row 3 + row 4+row 5] | | | | | **0.86** |

**Source: Bank of Tanzania (BOT)**

**Estimation of the Shadow Wage Rates (SWR) Factors: Ghana**

| | | Rural Unskilled Labour | Rural Skilled Labour |
|---|---|---|---|
| SW= | m*p+[w-m]*[1-1/v]*c | 85.80 | 90.91 |
| M= | Value of Marginal product of labour at market price [a] | 100.0 | 105 |
| P= | Border/domestic price ratio [b] | 0.86 | 0.86 |
| M*p= | Opportunity cost of labour | 85.80 | 90.09 |
| W= | Actual wage rate[c] | 100 | 100 |
| C= | Border/domestic consumption [d] | 1 | 0.86 |
| V= | Value of investment relative to consumption [the shadow price of investment relative to consumption or the social cost of consumption] = k[1-s]/CRI-[k*s]] | 0.85 | 0.84 |
| | Where k = marginal product of capital [e] | 0.12 | 0.12 |
| | s=rate of savings [f] | 0 | 0.05 |
| | CRI=consumption rate of interest [g] | 0.28 | 0.28 |
| | **SWR=SW/W** | **0.77** | **1.07** |
| | **Weighted average SWR Factor for rural traveller [h]** | **0.80** | |

Sources: Shahabuddin & Rahman (1992); Squire & van der Tak (1975)

[a] Field interviews in Moshi Rural District suggest that rural unskilled labour employed year round. i.e. 100. Assumed public private sector mix is 50:50 for skilled labour. Assumed public sector rate is 10% higher for skilled labour [50+55]=105

[b] The Standard Conversion Factor (SCF)

[c] Expressed in terms of 100

[d] For unskilled labour import content assumed to be negligible

[e] Opportunity cost of capital assumed at 12%

[f] Assumed 5% for skilled labour and negligible for unskilled labour

[g] Average lending rate of banks in rural areas. Lending rate in a rural bank in Yendi (Tendi Bonzali Rural Bank) in Jan. 2005 was 28%. It applies to all loan types from the bank.

[h] (SWR of unskilled labour)* r + (SWR of skilled labour) * (1-r); where, r = proportion of unskilled worker travelling on rural roads = 0.90 (assumed)

**Estimation of the Shadow Wage Rates (SWR) Factor: Tanzania**

| | | Rural Unskilled Labour | Rural Skilled Labour |
|---|---|---|---|
| SW= | M*p+[w-m]*[1-1/v]*c | 85.80 | 90.91 |
| m= | Value of Marginal product of labour at market price [a] | 100.0 | 105 |
| p= | Border/domestic price ratio [b] | 0.86 | 0.86 |
| m*p= | Opportunity cost of labour | 85.80 | 90.09 |
| w= | Actual wage rate[c] | 100 | 100 |
| c= | Border/domestic consumption [d] | 1 | 0.86 |
| v= | Value of investment relative to consumption [the shadow price of investment relative to consumption or the social cost of consumption] = k[1-s]/[CRI-[k*s]] | 0.85 | 0.84 |
| | Where k = marginal product of capital [e] | 0.12 | 0.12 |
| | s=rate of savings [f] | 0 | 0.05 |
| | CRI=consumption rate of interest [g] | 0.142 | 0.142 |
| | **SWR=SW/W** | **0.86** | **0.91** |
| | **Weighted average SWR Factor for rural traveller [h]** | **0.86** | |

Sources: Shahabuddin & Rahman (1992); Squire & van der Tak (1975)

[a] Field interviews in Moshi Rural District suggest that rural unskilled labour employed year round. i.e. 100. Assumed public private sector mix is 50:50 for skilled labour. Assumed public sector rate is 10% higher for skilled labour [50+55]=105

[b] The Standard Conversion Factor (SCF)

[c] Expressed in terms of 100

[d] For unskilled labour import content assumed to be negligible

[e] Opportunity cost of capital assumed at 12%

[f] Assumed 5% for skilled labour and negligible for unskilled labour

[g] Average lending rate of banks in rural areas. No such data were available. Weighted average lending rate in Tanzania in Jun. 2004 was 14.2%. Source: Bank of Tanzania web site: http://www.bot-tz.org/Publications/EconomicIndicators/Interest_Rates.htm

[h] (SWR of unskilled labour)* r + (SWR of skilled labour) * (1-r); where, r = proportion of unskilled worker travelling on rural roads = 0.90 (assumed)

Appendix XVII

## Types of Photographs Used to Explain Travelling Conditions

| Comfortable Travelling Conditions | Uncomfortable Travelling Conditions |
|---|---|
|  |  |